ELECTRIC RAILWAY JOURNAL

Consolidation of Street Railway Journal and Electric Railway Review
Published by McGraw-Hill Company, Inc.
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Volume 61 New York, Saturday, January 20, 1923 *Number* 3

Are You Maintaining an Asylum for Antiquated Machinery?

EVEN a casual inspection of almost any electric railway shop will disclose the presence of some machines that ought to have been junked long ago. They are kept partly as a recognition of their excellent past record and partly because the wastefulness of continuing them in service indefinitely is not clearly recognized. The fact is that many machines, purchased for work which at the time they could do economically, are now entirely obsolete. An unprejudiced critic, coming on a property from the outside, could easily point out the offenders, if the local master mechanic is too close to the job to enable him to do so.

Great progress has been made within a few years in the design of machines for performing the routine and special operations which go into electric railway maintenance shop work. This is lost to the property which is still depending upon machinery purchased ten or twenty years ago. A profitable task for some one on most any property would be to make a study of the advances in this line that have been made. The exhibits held in connection with the electric railway and steam railroad conventions are of great value in this connection. A visit to a really up-to-date shop is always stimulating.

An effort will be made in the special monthly issues of the JOURNAL to direct attention to the best methods of performing all mechanical operations which are involved in maintenance work.

Modern Track and Line Maintenance Methods Involve the Use of Good Tools

THE danger of becoming a repository for obsolete machines is not confined to the shop, by any means. The same principle applies on the track and line. There is some kind of a machine, and in many cases there are several kinds, for the performance of every routine mechanical operation. Inventors and manufacturers have been stimulated lately to produce such machines in profusion on account of the high cost and scarcity of skilled labor. As R. H. Dalgleish wrote, in his "New Year's message" in the issue of this paper for Jan. 6, page 14: "The use of labor-saving tools has done more, in the engineering field, to increase output than anything else that I can recall." He had the track in mind particularly, but this statement is true throughout the whole range of maintenance work.

If one wishes to realize vividly the changes which have been going on in this line recently let him but contrast the present-day methods of cutting out worn rail, building up joints, eliminating rail corrugations and other irregularities, drilling rail, mixing concrete, tamping ties, replacing trolley wire, etc., with the procedure of only a few years ago. The result is amazing, and more amazing still is the slight investment cost involved in the machines that do this work as compared with the savings produced. The estimates of expenditure for 1923 which were published in this paper two weeks ago indicate a wonderfully active year in rehabilitation. It behooves the maintenance men to insure the maximum return on every dollar by judicious recommendations to the boss to purchase the labor-saving machines.

Carry the Question Mark in Your Mind During 1923

A QUERYING attitude on the part of any individual, and especially on the part of a man connected with a large organization like an electric railway, is something to be encouraged. It would be a good idea at this outset of a new year for every one of us to resolve that we will take this attitude toward all elements of our work in order that we may be sure that we are getting the best out of it.

Most of us seem to go on the assumption that because the things we are doing have been done that way for a considerable time with a fair degree of success, it is all right still to go along in the old ruts. It takes a jolt sometimes to make us change our ways or wonder if it is about time they were changed. This is perfectly natural. All human beings are characterized by mental inertia. We are not so much to be blamed for not being more alert as we are to be pitied. The alert fellows are the ones who are getting along, and the alert ones are those who are always asking questions.

The fellow who looks at every practice on his own property, in the light of what he learns is being done on other properties, with a question in his mind is not likely to go to sleep on his job. He will be getting up new schemes all the time, some of which will be worth while and will make real savings. It goes without saying that if a practice on one's own property is good, it will stand questioning; if it is not good, the sooner this fact is appreciated the better. Similarly, when some other company seems to have a practice that is getting results, it is a fair question whether that practice cannot be applied at home.

Now, it is not a wise plan to be always changing methods, just for the sake of having a change. Some people are restless and are not satisfied to go along in the old way even if they know it to be the best one. However, one can maintain a questioning attitude toward everything without being constantly in the process of change. Would it not be well during the coming year, even if it is a little late for New Year's resolutions, to determine definitely that nothing will be accepted as best just because it has been doing the work for a long time, but that everything will be weighed to determine the possibility of improvement?

Drawing Ideas from the Shop Employees

MANY wide-awake companies spend considerable money in the quest of ideas by sending delegations to inspect other properties. It is usually a profitable investment, but too often the same open-minded spirit does not permeate the whole organization, and some heads of departments actually resent any approach by a subordinate who claims he has an improved method for accomplishing a given result.

This latter criticism does not apply to the master mechanic of a certain interurban who has been successful in encouraging very helpful suggestions from his shop foremen and other shop employees. This master mechanic, who believes that 90 per cent of his job is to get the best work possible from his employees, explained that one must ever be in a receptive frame of mind for shop kinks, suggestions, etc. When a scheme is recognized as useful, the man who suggested it should be helped in perfecting it. In other words, his interest must be held by allowing him to work the thing out to a success. A pride is thereby created and incentive is not dulled but sharpened. This master mechanic's advice, in short, was: "Don't suppress experimentation on the part of shopmen. Encourage inventiveness, but give the men all the credit for any successful development." The fruits of this policy were then demonstrated when various improvements and developments were described to the JOURNAL representative by those who had conceived and perfected the ideas.

Aside from value or usefulness of any article so developed, its originator feels a great confidence in his ability and is spurred on by any success, however small, to produce other time and labor saving methods or devices. Besides, more common ground and better understanding is established between the master mechanic and his men.

Figures that Don't Mean What They Say

IT HAS BEEN noticeable recently that whenever the cost of lubrication has been discussed attention has been focused chiefly on the cost of the oil used, plus, perhaps, the labor expense of its application. However, it must be remembered that the effectiveness of equipment lubrication, not its cost, is the factor controlling maintenance expenditures, and the amount of the latter is often increased by a decrease in the direct lubrication expense. A case is recalled where the president of a large railway noticed a statement made by the superintendent of equipment of a near-by property giving very low unit lubrication costs; in fact, about one-quarter of those of the large city system. Such a potential saving was considered worthy of investigation, but the answer turned out to be in the higher charges in the other important items largely controlled by the quality of rolling stock lubrication. In other words, the higher unit cost for lubrication on the larger property was more than justified by better performance.

On this basis, what are all the factors that enter into a comparison between two methods of lubrication or two kinds of lubricant? If the effectiveness of each is measured by service and low cost of all items affected by the quality of lubricants, should not these factors be included in a fair economic comparison? Cost of lubricant and labor to apply it, of rewinding armatures damaged because of burned-out bearings, of pull-ins, and bearing life, all on a mileage basis. These were included in the analysis made by those digging into the low figures in question, and they found a quadrupled expense for the lubrication cost alone was more than wiped out by the economies in other dependent items.

Stimulating Interest in Maintenance Work

KEEPING equipment going after it is built is not nearly as interesting as building it. Every one likes to see the results of his work, which is rather difficult to do when this work consists of such routine operations as repacking bearings with waste, adjusting brake rigging, slotting commutators, tightening track bolts, splicing trolley wire, etc. One bearing, brake rigging, commutator, track joint or trolley splice seems just like another. But there is a way to overcome the tendency toward monotony or disinterest on the part of the employees who do routine maintenance jobs. The work can be made interesting by letting the men know the results they are producing in comparison with other men on similar work.

The problem of stimulating interest differs with the size of the property. On a small railway the master mechanic, the line superintendent and the roadmaster know their men personally and can do a great deal without much organization if they want to. For example, on one property where about seventy-five cars are given light overhauls in a division shop, the master mechanic divides his cars into groups, assigning each to a crew for inspection and small repairs. Each month records are posted showing the pull-ins of the cars of each group and the kinds of defects which have been remedied. These indicate whether thorough inspection work is being done, and promote a spirit of team competition. In other words, the same idea which is back of a baseball team, impelling it to win, that is, the sporting instinct, is utilized to make interesting what might otherwise be humdrum effort.

Obviously, when men have a zest for their work they not only enjoy it but they do it better. This means not only reduced maintenance cost but, in the end, better jobs for the workers.

On large properties more organization is needed to accomplish results like those which are easier to get on small ones, but the same principles apply. The plan followed by steam railroads in recognizing good track maintenance work by sections has given excellent results. An award is taken as a great honor and the men on the "prize section" keep every traveler over it informed of the fact that he is having the privilege of riding on some high-grade track. Anything of this sort that will promote teamwork will bring good results, and the men will like it because it takes away something of the monotony of their tasks.

The large company has one advantage in that it is usually split up into operating lines, sections or divisions, with the carhouse as the operating center. A spirit of emulation can be easily developed by means of competition among these operating units, even if all are not favored with equally good equipment. Handicaps can be provided, if necessary, to equalize discrepancies in this direction.

But whether the company is large or small, it is "missing a big bet" if it is not stimulating its men to do their best by enlisting their interest.

Maintaining Electric Railway Motors

Particular Care Should Be Used When Replacing Field Coils to Insure that They Are Connected Properly and that the Correct Polarity Is Obtained—Various Methods for Testing Are Given

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ALL railway operators are vitally interested in making a good showing in their record of car-miles per car failure, for on this basis the management, in a general way, is able to judge the condition of the equipment and the efficiency of the shop organization. There are a number of things which affect this record such as collisions, poor condition of track and overhead construction work, rough handling and abuse of equipment by trainmen, severe operating schedules, etc., which are beyond the control of the master mechanic who is responsible for the upkeep of the equipment, and these factors should be given some consideration in connection with a study of this question. On the other hand, if the equipment is left to run down by neglecting the details in connection with the electrical and mechanical repairs of the cars, there will be a noticeable increase in the number of car pull-ins with a consequent lowering of this record, to the discredit of the shop organization. With the thought in mind to assist operators in reducing their motor failures, which would in turn boost their record of car-miles per car failure, the following detail methods in connection with the upkeep and maintenance of railway motors are given for consideration:

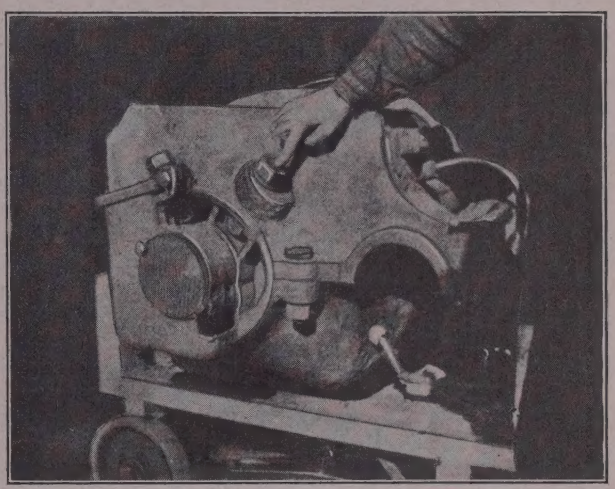
During the general overhauling period, when the field coils are taken out of the frame to be cleaned, redipped in insulating paint or varnish and baked, or when damaged coils are replaced, it is very important to have them put back in the frame properly, with the leads so connected as to give the correct relative polarity, to secure the required magnetic flux. If for any reason one or more of the main field coils be connected so that the current passes through in the wrong direction, this motor will run at a higher speed, and when put on the car will tend to "hog" the load and result in overheating the armature. Should one or more of the commutating-pole coils be connected in wrong, the motor will commutate poorly and tend to flashover from brush-holder to brush-holder or from brush-holder to ground.

In order to prevent wrong connections, when frames are being overhauled or repaired, and to aid the operating man in connecting field coils to give satisfactory operation, a standard winding diagram of the motor being repaired should be obtained from the motor manufacturer and used as a guide in connecting the field coils.

Precautions in Replacing Field Coils

The following points are well worth following while overhauling or repairing field windings:

1. Coils and frames should be cleaned and painted.
2. Coils should be placed on poles properly.
3. Coils should be spring supported and, where necessary, backed up by washers of either metal or fibrous material well painted.
4. In replacing coils, the spring and washers should be taped temporarily to the coil to keep them from working out of place and from getting in between the pole and pole seat when assembled.
5. The surface of the pole and pole seat should be cleaned to insure a good close fit when the bolts are drawn up tightly.
6. The pole should never be pounded into place with a sledge, but a block of wood or a piece of soft metal, such as copper, should be used.
7. Pole bolts should be drawn up tightly and lock washers placed under each nut. White lead should be applied over the nuts after tightening to prevent entrance of water.
8. The assembled pole should be sounded by using a small hammer, to insure that it is drawn up tightly.



Westinghouse 101 Motor Modified to Take 101-B-2 Housings Using Two Radial Through-Bolts

9. Connections should be made as shown on the manufacturer's winding diagram.
10. The polarity of the assembled field coils should be checked carefully.
11. The connections between the coils with cable leads should be made by butting the ends together and then covering the joint with a copper sleeve and soldering well.
12. When the coils have terminals, the ends of the cable connected to the terminal should have a metal sleeve soldered to the wire. This in turn should be held in the terminal by screws securely tightened and locked.
13. The ends of the cables connected to the brush-holders should be provided with metal sleeves or terminals, securely clamped and locked to the brush-holder casting.
14. All wiring around the frame should be securely anchored to the frame and tied down to prevent vibration and to keep the insulation from being rubbed or cut by parts of the rotating armature.
15. Individual coils should be dipped and baked. To secure the best results, dip and bake the entire frame after the coils are in place and all connections are made.
16. The motor leads where they come out of the frame should be well protected by insulating bushings.
17. It is considered the best practice in connection with all modern railway motors and it is recommended for old motors to use cables coming out of the body of the coils instead of heavy brass terminals, to make the wiring connections around the frame. The main objection to the use of terminals is that they are more likely to break off, due

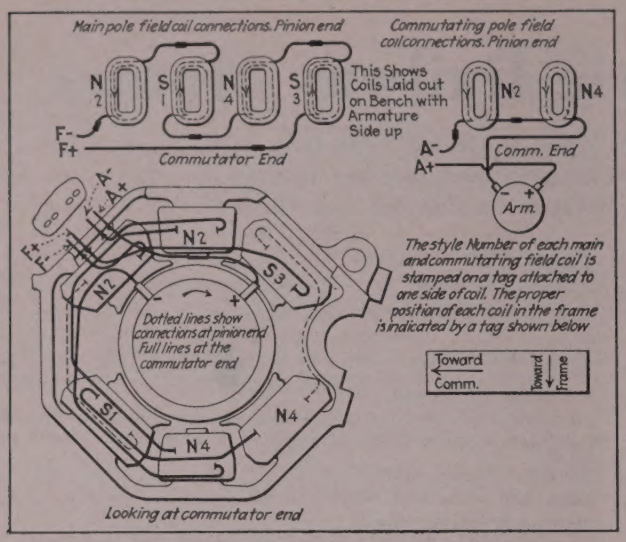

Main pole field coil connections. Pinion end
Commutating pole field coil connections. Pinion end
This Shows Coils Laid out on Bench with Armature Side up
Commutator End
Comm. End
Arm.
The style Number of each main and commutating field coil is stamped on a tag attached to one side of coil. The proper position of each coil in the frame is indicated by a tag shown below
Toward Comm.
Toward Frame
Dotted lines show connections at pinion end Full lines at the commutator end
Looking at commutator end

Fig. 1—Typical Field Winding Diagram for Railway Motor

to vibration, or to develop a loose connection and burn off the lead. Another disadvantage is the difficulty of properly insulating the terminals after the connections are made.

The object of testing the polarity of field coils is to determine whether the main and commutating-pole field coils are properly connected. This test should be made whenever field coils are replaced, because coils are sometimes placed over the poles of the frame inverted or reversed, and wrong connections thus made show up in faulty operation of the motor. This test will show up conditions which might cause an armature to run hot due to an unbalanced magnetic field circuit caused by a reversed main field coil. It will also indicate conditions which might cause poor commutation and flashing in a commutating-pole motor because of a reversed commutating coil.

The testing circuit should be arranged as shown in Figs. 2 and 3. At least five or six sets of heaters or frames of resistors should be put in the circuit at first. If a readable deflection on the polarity indicator is not obtained, part of the grids should be omitted to increase the current. If one is available, an ammeter in the circuit will indicate whether the current is large enough to be liable to cause any damage to the windings or to connections.

A very satisfactory polarity indicator can be made from a piece of steel banding wire about 3 in. long, with one end bent over about ¼ in. to distinguish it. This should be suspended at the middle by a short thread. When this is first used it should be held at the pole for at least one minute, when it will become magnetized, and it is then ready for use.

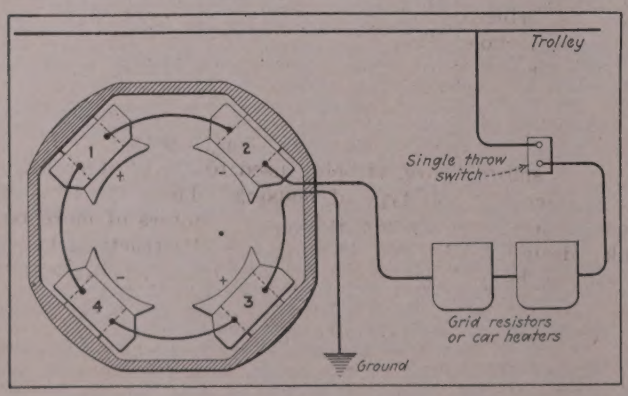


Fig. 2—Diagram of Connections for Polarity Test of Main Field Coils on Non-Commutating-Pole Motor

METHOD OF TESTING FOR POLARITY

The motor can be either on the trucks or out on the floor. It can have the armature in or out of the frame and, if a split-frame motor, it can be open or closed. With the coils all connected in series and the two field leads connected to the test circuit, as shown in Fig. 2, the switch is closed and current passes through the field coils, if they are connected properly. By holding the polarity indicator close to the ends of the coil, or to the pole stud bolts on the outside of the frame, the polarity indicator will reverse at alternate poles. Thus if No. 1 pole attracts the positive end of the polarity indicator, No. 2 should attract the negative end, No. 3 the positive end and No. 4 the negative end. If these conditions are not obtained the field winding connections should be changed.

If the frame to be tested has commutating poles, two separate tests should be made, one on the main field coils as previously described, and the other on the commutating-pole coils. This latter is made in the same manner, with connections as shown in Fig. 3. In this case only one of the motor leads (the negative armature lead) can be used, as the other lead from the commutating coils goes to one of the brush-holders. Four-pole railway motors with only two commutating coils, which are located directly opposite each other, also four-pole motors with three commutating coils, are tested in the same manner. In the case of the two-pole machine the polarity of both coils should be the same, while in the three-pole machine the two coils on diametrically opposite poles should be of the same polarity, while the intervening coil should have the opposite polarity.

In making the test the pivoted compass should be held in a horizontal position; or if a suspended polarity indicator is used this should be held by the free end of the suspension thread. All coils should be tested for polarity at the same end. Results should never be considered final until they have been checked the second time, as there is a possibility of the needle of the indicator having its polarity reversed. It is not necessary that a certain pole have a definite polarity (either positive or negative), but it is essential that the polarity of adjacent poles be different.

In the case of a commutating-pole machine, it is important to have the proper relation of polarity between the main and commutating field poles. To check this the negative armature lead of the motor should be connected to the positive field lead, the positive armature lead to the trolley side of the test circuit, and the negative field lead to the ground side of the test circuit. If the armature is in the frame and the brushes are making contact on the commutator, current will flow through all the windings. If the armature is not in the frame, then it will be necessary to short-circuit the brush-holders. With these conditions, the polarity of a main pole should be the same as the polarity of the commutating pole next to it in a clockwise direction when facing the commutator end of the motor.

When the two halves of a split-frame motor are bolted together for the machining of the housing fit, a liner of sheet steel about 0.017 in. thick should be placed at the split to insure a good clamping action on the housing when the two halves of the motor frames are bolted

together. During the overhauling period, or when motor troubles have developed and frames are opened up to take out the armatures, there is a possible chance of losing this clamping action in reassembling due to one or more of the following reasons: (a) Frame bolts not drawn up tight; (b) lock washers left off; (c) a poor grade of bolt used which will stretch; (d) dirt at the split of the motor frame.

Motors operating under the above conditions, due to the pounding action of the armature and hammer blows in passing over the rail joints, will soon develop considerable wear of the housings and housing seats, as well as at the tap bolts and tapped holes in the housings.

This trouble has been one of the main factors leading to the development of the present standard box-type motor. The use of housings that have a tight driving fit in the ends of the solid frame has practically eliminated loose housings in railway motors. A number of methods for repairing loose housings in split frame motors, some temporary, others permanent, have been tried out on various properties and found to work out very satisfactorily.

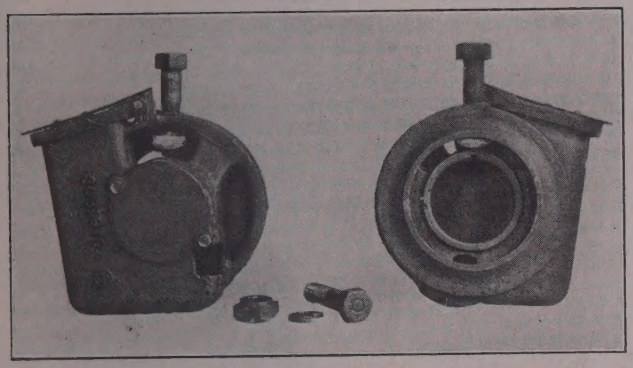
Strips of canvas duck treated with white lead may be placed on the worn housing, building it up to such a diameter as to insure a good tight clamping action of the two halves of motor frame when bolted together. In order to check whether the two halves of the frame of the motor are clamping the housings, it should be possible to get a 0.005 to 0.007 in. feeler between the frames at the split when they are bolted together with built-up housings in place.

Strips of advertising sign cards held in place by shellac are sometimes fastened to the worn housing, building it up to such a diameter as to insure a good tight clamping action of the two halves of the motor frame when bolted together. When the housing is not too badly worn, if made of malleable iron it can be built up by means of the electric or oxyacetylene welding process, after which it should be machined to fit the housing seat in the motor frame, plus enough allowance to insure a good tight clamping action of the two halves of the motor frame when bolted together.

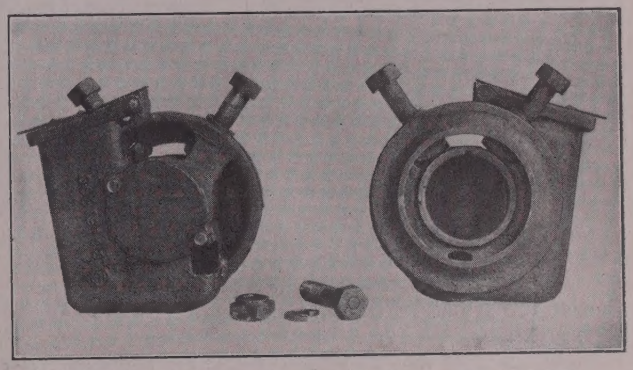
The worn tap bolt holes should be bored out large and cast iron plugs (which have been found to give best results) should be driven tightly into these enlarged holes. The worn housings should be turned down and a steel ring about ⅜ in. thick should be shrunk on the housing. If the housing has a double flange one of these must be turned off and a new flange made on the shrunk-on ring. It can then be turned down to such a diameter as to insure a good tight clamping action of the two halves of the motor frame when bolted together. New holes should be drilled and tapped in the housing through the shrunk-on ring into the cast-iron plugs to receive the tap bolts.

Building Up Housing Seats on Motor Frames

The housing seat in the motor frame may be built up by means of the electric or oxyacetylene welding process and then rebored to a smaller diameter to fit the worn housing (which should first be trued up), with enough allowance to insure a good tight clamping action of the two halves of the motor frame when bolted together. Another method is to bore out the housing seat in the motor frame and then to build this up by means of a semicircular steel liner, riveted in place, after which it should be welded at several points. The housing seats can then be rebored to fit the worn housings (which should first be trued up), with enough allowance to insure a good tight clamping action of the two halves of the motor frame when bolted together. Enough metal should be machined off at the split of both halves of the motor frame to insure a good tight clamping action on the worn housings of both halves of the motor frame when bolted together. When this method is used it will be necessary to rebore the pole faces, to make certain that the correct air-gap is maintained.



Through-Bolt Type of Housing Held by One Vertical Bolt



Through-Bolt Type of Housing Held by Two Radial Bolts

In connection with the repairs on worn bearings, several good methods have been used to fix up the worn tap bolt holes. Sometimes a longer tap bolt is used which will engage the lower threads of the tapped holes in the housing that have not been damaged by the loose shorter bolts.

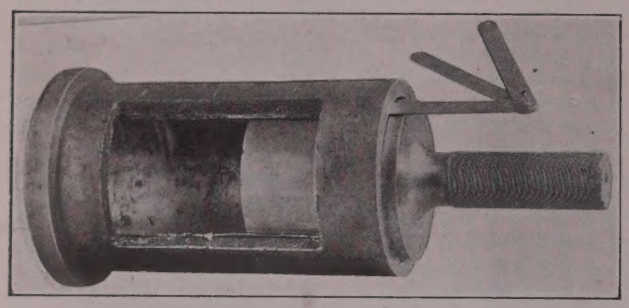
Another method consists of filling up the old worn holes by welding in (preferably Tobin bronze) and reboring and retapping new holes. The worn holes may be drilled out to a larger diameter, and a threaded steel plug welded at edges may be inserted. This plug should be drilled and tapped to take the standard size bolts. Worn holes may be retapped for the next larger size bolts. When shrunk-on rings are used the enlarged holes may be drilled out and cast-iron plugs driven in tightly.

A new type of housing arranged with through bolts, as shown above, is being used to replace the old badly worn tap bolt type of housing. This type of housing is also used on new split frame motors of more recent design. With this through-bolt construction, housings can be kept readily in good condition, as there are no tapped holes in the housing to wear, should they tend to work loose in service. If, on account of lack of maintenance, the threads of the through bolts become worn or damaged, they can be renewed at a small expense.

On motors of the split-frame type, using either the new tap bolt type, revamped tap bolt type, or the new through-bolt type of housing, to insure against housings working loose it is advisable to keep frame bolts and housing bolts drawn up tight. Lock washers should also be applied to all bolts and a good grade of heat-treated steel bolts should be used. When assembling motors all dirt at the split should be removed and the armature bearings should be kept in good condition, all bolts should be inspected regularly and systematically, and they should be drawn up tight.

CHECKING ARMATURE AND AXLE BEARING WEAR

The proper maintenance of motor bearings involves careful inspection and gaging to determine when renewals should be made in order to keep the motors in good operating condition. This is most important in



Gaging the Radial Wear of an Armature Bearing after Seven Years of Active Service

connection with armature bearings, for when these are neglected and allowed to wear down too far, the armature will rub on the poles, which may cause the destruction of the armature winding and more or less damage to the fields.

In the case of motors mounted on cars equipped for single-end operation, running in one direction only, the bearing wear due to the torque of the motor and the action of the gear and pinion depends on the rotation of the armature, as is shown in Table I, which applies to either double or quadruple equipments of railway motors. With cars running in both directions, wear on both the armature and axle bearings is more uniformly divided between the top and bottom.

To determine when bearings are worn to the limit and should be replaced several tests may be made. First a light test can be applied to motor frames that have inspection holes so located that a light can be held at one end of the motor and clearance in the air-gap observed by the workman. This method depends largely upon the judgment and experience of the man making the inspection and cannot be relied upon entirely.

Another method, very commonly used by many operators, requires a sweep gage made of varying thicknesses of cardboard or soft metal, and sometimes a long narrow flexible steel strip fitted with steel pads of varying thicknesses. These gages are inserted in the air-gap at the lower side of the motor. When the limiting minimum gage cannot be entered, the bearings show maximum allowable wear and should be renewed. In general, this method requires that the lower commutator cover be removed in order to apply the gage. This method may be applied to the upper side and a similar type of gage used, except that when the maximum gage can be entered in the air-gap at the top side of the motor the bearings show maximum allowable

TABLE I—DIRECTION OF BEARING WEAR

Position No.	Inside Hung Motors: Armature Rotation	Inside Hung Motors: Bearing Wear Armature	Inside Hung Motors: Bearing Wear Axle	Outside Hung Motors: Armature Rotation	Outside Hung Motors: Bearing Wear Armature	Outside Hung Motors: Bearing Wear Axle
1 and 3	Left	Down	Down	Right	Up	Up
2 and 4	Right	Up	Up	Left	Down	Down

wear and should be renewed. When using this method the gages are inserted in the top commutator opening, the cover of which can readily be removed for this inspection.

On very small armatures the bearing wear can be approximately obtained at the commutator end by reaching in through the top commutator opening and lifting the armature and noting the play. This is a crude method and is only used to get a rough approximation of the wear. If play is noticeable, the lower commutator cover can be removed and a sweep gage used to check the air-gap. A more reliable test, similar to the above, is made by removing the lower half of the gear case, then prying up the armature at the pinion and measuring the lift from a fixed point on the motor frame or the gear. This scheme gives actual pinion and bearing wear and is satisfactory, but involves considerable labor and time.

The armature may be lifted by motor power. This method has been used successfully by a number of operators, but requires the use of a minimum size sweep gage, which is entered into the air-gap of the motor and, with the brakes set, power is applied by using the first notch of the control only. If the gage shows clearance under these conditions, the bearings are considered O.K. This test must be made with the reverser on the car thrown first in the forward and then in the reverse position in order to check all the motors on the car.

When the motor is off the car and the pinion is removed, the pinion and bearing wear can be measured with a feeler gage. This method is accurate but not practical, as it requires too much work to check the bearings under these conditions. This method can be used to check the commutator and bearing of a motor on the car by removing the commutator end dust cap. With experience, the condition of the pinion end bear-

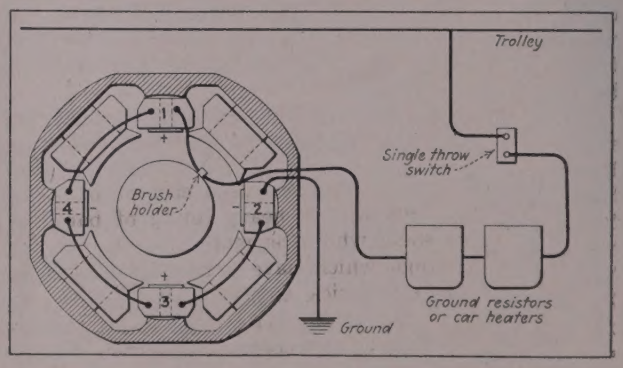


Fig. 3—Diagram of Connections for a Polarity Test of the Commutating Coils on Commutating-Pole Motor

ing can be estimated from the wear on the commutator end.

One operator reports considerable success in determining maximum allowable bearing wear by building up the front core band with solder and turning this down so that it extends $\frac{1}{16}$ in. above the armature iron. When this band begins to show signs of rubbing on the poles it is an indication that the bearings should be renewed. Three or more pads of solder built up $\frac{1}{16}$ in.

above the band and spaced equally around the armature would give a similar indication.

A device has been patented and used by one operator which is arranged so that when the bearings wear down to a predetermined point contact is made between the laminations of the armature and a small brass wheel supported by the frame. This wheel is caused to rotate and make contact with a bare fused jumper between the field coils, which grounds this field jumper, burning the fuse off and opening the motor circuit.*

Excessive wear of axle bearings is not as serious as that of armature bearings, as it only subjects the frame, axle cap and axle cap bolts to increased shocks and strains, and tends to spread the gear centers, with resulting less efficient gear operation, and rapid wear. For the above reasons, it is considered good practice to renew axle bearings that show a wear of from $\frac{1}{8}$ to $\frac{5}{16}$ in. This is especially true with motors using 4 to $4\frac{1}{2}$ diametrical pitch gears. This wear can be checked with a feeler gage by the workman from the pit, if the motors are not fitted with axle shields. Where shields are used and are fitted with inspection holes, the bearing wear can be checked through these openings. If inspection holes are not provided in the axle shield, it is necessary to remove them to make the inspection.

Another method, similar to that explained for checking armature bearing wear, consists of setting the brakes and throwing the control to the first notch and noting the play of the bearing by the lift of the motor frame. To check all motors on a car requires that this test be made for both forward and reverse positions of the reverser.

In connection with the life of armature bearings of railway motors, there are a number of things that must be considered when making a comparison of bearing life on various motors in service on different properties. It is a fact that the life of bearings of the same type of motor operating under apparently the same service conditions will vary widely, which no doubt is due to something inherent in the particular bearings in question, or to carelessness on the part of the men in charge of the upkeep and oiling of the bearings. With this in mind, it should be expected to find a wide variation in the life of the bearings on the different types of motors where they are subjected to all manner of service conditions, different methods of oiling, a large variety of lubricants, and with the upkeep and maintenance in the hands of many different types of workmen.

Most of the older type of motors used cast or malleable iron bearing shells with a heavy lining of babbitt anchored to the shell, while the more modern motors use bronze bearings which have a thin lining of babbitt which is made to stick to the shell by first tinning the inside of the shell. The following combinations are the ones found most common in service:

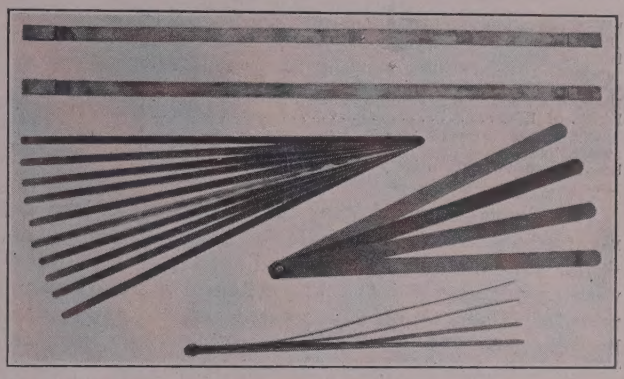
Shells	Lining Held by	Babbitt Metal
*Malleable iron	Anchor holes	Lead base
*Malleable iron	Anchor holes	Tin base
Bronze	Shell tinned	Lead base
†Bronze	Shell tinned	Tin base
Bronze	Shell tinned	No lining
Bronze	Shell not tinned	No lining

*These bearings can be improved by tinning the shells before babbitting.

†This type of bearing is the one that seems to give best all-around results in service and is most commonly used.

It is extremely important that all the details of babbitting bearings be carefully worked out and followed in order to get a finished bearing that will stand up satisfactorily under the severe service conditions. In this connection the bearing shells should be clamped carefully before babbitting and bronze shells should be well tinned. This operation will also improve bearings with malleable iron shells. It is desirable to use a good tin base metal for babbitting and the bearing shells and mandrels should be heated before pouring the babbitt. Babbitt should be poured at a temperature of from 460 to 480 deg. C. If all bearings are well tinned and then babbitted, the lining will stick to the shell and will be like a solid piece of metal. If such a bearing is held up by a piece of string and struck with a piece of metal, it will give out a clear bell-like tone.

Some operators babbitt bearings to the exact size of the journal plus an allowance and operate the bearings in this manner and apparently get satisfactory service under these conditions. The most common practice and the one that seems to give the best all-around results is to babbitt the bearing small and then to bore out the bearing to fit the journal. In some instances, the bearings are finished by means of a broaching tool which is forced through the bearing.



Feeler Gages for Checking Air Gaps and Bearing Wear on Railway Motors

In general it is considered good practice to have all armature bearings fitted with oil grooves, so as to provide a better distribution of the oil to the surface of the journal. At least one of these grooves should extend to the bearing flange to supply oil at the rubbing surface between the bearing and the wiper ring. Bearings should have approximately from 3 to 5 tons press fit in the housing and in addition they should be held by either a key or a dowel as an emergency precaution. For this purpose, keys seem to be more satisfactory.

The most common type of bearings used are those fitted for oil and waste lubrication. The waste, preferably wool, is first soaked in a good grade of car oil for about twenty-four hours, and is then allowed to drain, after which it is packed firmly in the housing up to and around the bearing window. The housing is then filled up to within an inch of the top with waste packed in comparatively loose. It is considered good practice to repack these bearings every three months, putting new waste next to the journal. All waste should be removed about once every year.

In oiling bearings, a good grade of summer and winter car oil should be used. The most common practice is to use from one to two gills of oil at each oiling period, which is on the average every seven days. The use of too little oil is poor efficiency, as this apparent saving is more than offset by the added expense, due

*This apparatus was described in detail in the ELECTRIC RAILWAY JOURNAL for May 17, 1919, page 971.

to either hot bearings or excessive bearing wear. The best results are obtained by pouring the oil into the separate oil well chamber, so it must feed up through the waste to the journal. If poured in on top of the waste it will tend to flood the inside of the motor.

Reports from a number of railway properties, both large and small, operating a great variety of different types of motors in city service show the following in connection with their armature bearing life:

CONDITIONS AND LIFE REPORTED

Material of bearing shell	Mostly bronze shells
Material of bearing lining	Tin base babbitt
Type of lubrication	Oil and waste
Oil grooves used	Eleven yes; five no
Oil grooves extended to the flange	Ten yes; six no
Period of lubrication,	Seven days minimum, fifteen days maximum; majority of roads, seven days
Radial wear allowed,	1/32 in. minimum, 3/16 in. maximum; 1/8 in. average
End wear allowed	1/16 in minimum, 3/16 in. maximum; 1/8 in. average
Type of gearing	Spur
Life of bearings,	*15,000 miles minimum, 200,000 miles maximum; 80,000 miles average
Method of holding bearings	Eleven use keys; five use dowels
Limit of life	Radial wear

*This minimum of 15,000 miles was given as the mileage between babbitting, and it is probable that a great number of the bearings were not entirely worn out when changed.

The allowable radial wear for armature bearings as reported above is from 1/32 in. to 1/16 in, with an average of 1/16 in., while the end wear reported is from 1/16 in to 3/16 in., with an average of 1/8 in. These figures are fairly representative and should be accepted as good practice to be followed. These figures are given for bearings which are used in connection with spur gears. There has been some question raised as to the end wear of armature bearings in connection with the use of helical gears. A recent investigation on several properties using both the spur and helical types of gears shows that the helical gearing does not produce any more armature bearing end wear than the spur gearing.

Boiler House Extension at Boston

FOR some years the Boston Elevated Railway has been somewhat short of power, not so much in the turbo-generator portion of its station equipment as in boiler capacity. In 1916 the company installed at its South Boston station a 35,000-kw. turbo-generator to supplement the three 15,000-kw. turbines previously in operation at that station. The turbine was designed to use steam at 200 lb. pressure, the pressure then being carried in the boilers in the station, but it was so arranged that additional stages could be provided in an extension of the turbine casing so that a steam pressure of up to 600 lb. could later be used in this machine if necessary. Since the installation of this turbine the existing boilers have been run at higher rating.

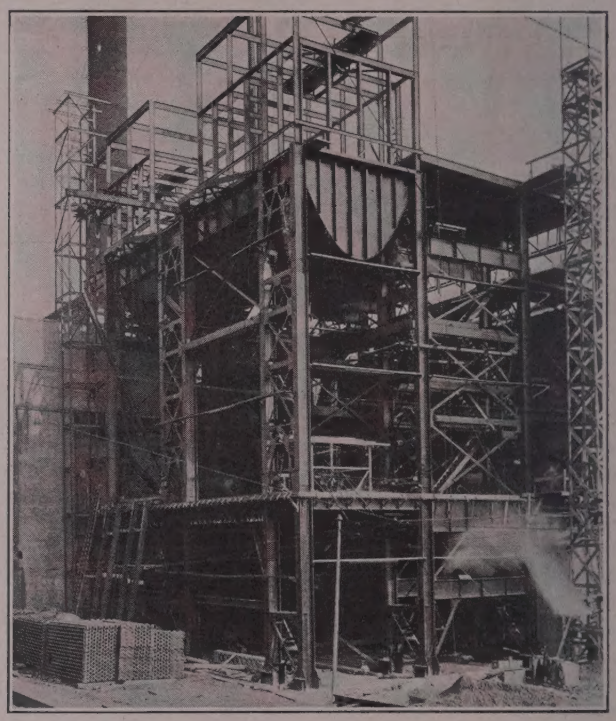
This turbine has been rebuilt so that at 200 lb. pressure it has a capacity of 40,000 kw. This made necessary an addition to the steam generating plant, to utilize the full capacity of the station and supply the needs of the railway for power. It was decided to keep for the present the steam pressure at 200 lb., but the new boilers will be designed so that later they can be run at 275 lb. pressure, supplying steam directly to the 40,000-kw. turbine, until it should seem desirable to reconstruct all of the equipment for this higher steam pressure. Incidentally, the changes in the large turbo-generator have increased its efficiency 3 per cent.

The new boilers, of which there are two, have a normal rating of 1,825 hp. each, with maximum rating of 6,400 hp. They are of the Babcock & Wilcox cross-drum type with thirty-nine sections in the header and twenty tubes high as compared with twenty-one sections in width and fourteen in height in the old boilers. A feature of the new boilers is their high setting, the distance from the boiler-room floor to the center of the mud drum being 15 ft. 4 1/8 in. They have a guaranteed efficiency as follows:

Rating	Efficiency
100 per cent	81.5 per cent
200 per cent	79.6 per cent
350 per cent	73.5 per cent

The boilers have Frederick underfeed stokers, supplied by the Combustion Engineering Company.

The boiler house of the station, including the coal bunkers and coal and ash conveyors, has been extended to accommodate these boilers, as shown in the engraving, the boiler house being designed so that duplicate boilers can be installed on the other side of the coal



Side View of Boiler House Under Erection

bunker in an extension of the boiler house to be built later. It was necessary, however, to build a new stack, and that is in course of erection. It will be of steel, 325 ft. high above the boiler-room floor and 355 ft. above the ground. The stack will be 15 ft. in diameter. Each boiler will be equipped with a Babcock & Wilcox superheater. Special foundations had to be provided for the station and stack on account of their height and comparatively small base area. The boiler plant was set on two concrete mats, each 36 ft. x 88 ft. and 6 ft. in depth. These mats rest on 400 Raymond concrete piles.

It is hoped that when this addition to the station is in operation, it will be possible to generate 1 kw.-hr. of alternating current at the switchboard for less than 1.6 lb. of coal, using coal containing 14,600 B.t.u.

The power station extension was designed by Dwight P. Robinson & Company, but the work of erection and the concrete work are being done by the Boston Elevated Railway with its own forces and by sub-contracting.

Track Reconstruction on South Clinton Street, Showing Pouring of Concrete Paving Foundation

North Street Improvement, Showing Track Drain, and New and Old Pavement

Features of 1922 Trackwork in Rochester

New York State Railways Makes Extended Use of Machinery in Track Construction and Reconstruction—The Past Year Was a Busy One in the Way Department

CONSIDERABLE construction work was done on the Rochester lines of the New York State Railways last year under the supervision of Horace A. Abell, engineer of way and structures. The principal work outside of extraordinary maintenance was as follows:

Reconstruction, South Clinton Street from Court to Monroe	625 ft.
Extension of North Clinton line, Norton to Ridge Road	4,800 ft.
Reconstruction, North Street, Main to Central	3,960 ft.
Reconstruction, Main Street, Culver to Winton	9,940 ft.
Addition of double-track connecting curves, Franklin and North	250 ft.
Replacement of light T-rail with 70-lb. T-rail on Charlotte line	4,500 ft.
Temporary tracks for detour, Main and Caledonia	700 ft.

While there was no one outstanding feature in this program, there were a number of detail features which are of interest. The following notes have been prepared, therefore, to answer such questions as would arise in the mind of a way engineer were he visiting this well-administered property.

The new tangent track in all instances was that as shown in the accompanying cross-section, consisting of 7-in. T-rail, wood ties and crushed stone ballast. A mechanical joint, consisting of an Abbott plate and standard bars with 1-in. high-elastic-limit drive-fit machine bolts, was used. This joint has proved very satisfactory under the track and traffic conditions in Rochester. The bonding was done with Electric Railway Improvement Company brazed bonds 5½ in. to 30 in. long.

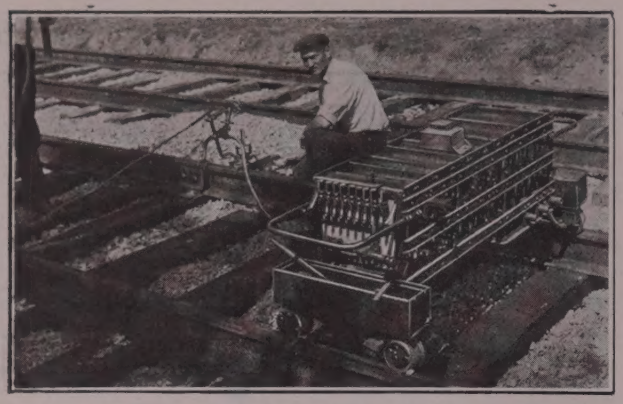
This type of track construction has been standard in Rochester for more than ten years, but slight departure made this year was the omission of tie rods and the tilting of the rails inward at a slope of 1 to 20 by adzing the ties. So far this procedure seems justified, as the wear from the wheels takes place in the center of the ball of the rail.

A feature in the design of the pavement which is a departure from previous practice is the omission of grooved rail block along the gage side of the rail. The sandstone paving block and brick are laid under the head of the rail. This permits of better bonding of the paving bricks or sandstone blocks, and makes a neater job. This construction is also believed to be better for vehicular traffic. A new type of track drain was used this year also. This provides a catch basin underneath the track. Its surface appearance is shown in one of the illustrations.

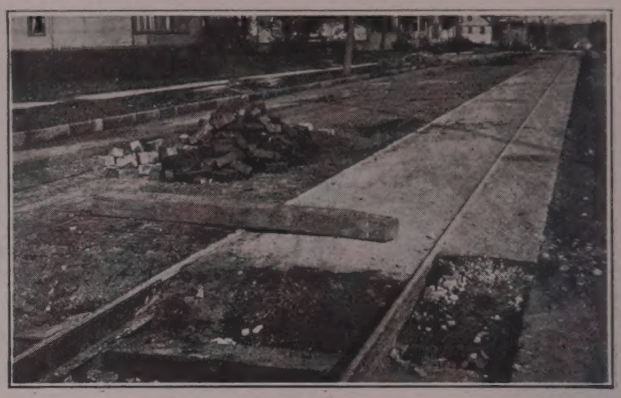
The South Clinton Street work was a short job, done under traffic. The annual maintenance on this short piece of track had always been exceedingly high. The

Electric Shovel at Work on North Street Job

Dump Cars in Work Train—Portable Forge at Left



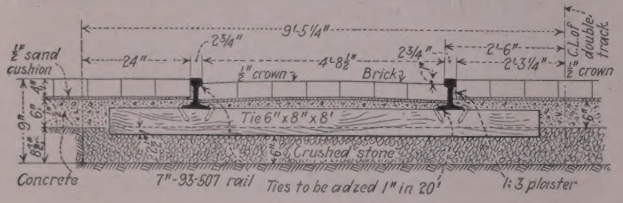
Resistance Type of Equipment Used in Rail Bonding



Track and Pavement in North Clinton Street Extension

wood block with which it was paved had never been satisfactory and the half-groove rail, laid in 1906, although not entirely worn out, caused many derailments when not exactly to gage. The new rail used on this job was L.S. section 93-507, and the pavement sandstone block.

The North Clinton Street job was a double-track extension from the old loop terminal at Norton Street to a new loop about half a mile directly northward, the old loop being left in place. Because of the lighter traffic anticipated over this line a 70-lb., 7-in. T-rail, L.S. section 70-267, was adopted, the joints being stand-



Standard Track Construction for High T-Rail with Brick Pavement

ard eight-hole bars with 1 in. drive-fit bolts. An Abbott plate was used under each joint. Brick pavement was laid in this track.

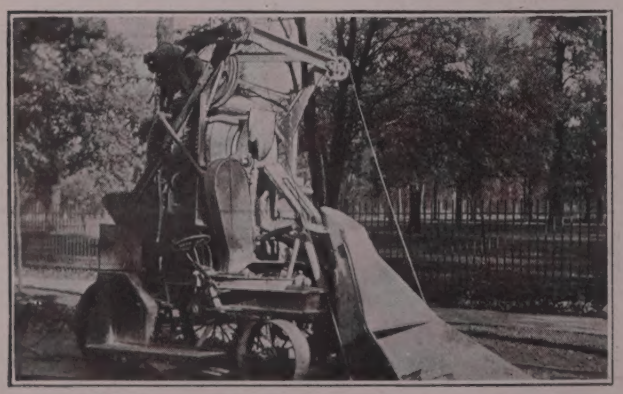
The North Street track had been in service since 1901 under fairly heavy traffic. The old rail was L.S. section 91-350, a 7-in. grooved rail. The old joints were of the electric-weld type, and wood ties and gravel ballast had been used. The new rail is L.S. section 93-507, with sandstone pavement. One track at a time was relaid, the car service on this track being rerouted to another street when necessary. A feature of the work was raising the entire track about 2 in. so that the city could place asphalt pavement outside the legal width without disturbing the old sandstone.

In connection with the North Street improvement, double-track connecting curves were built connecting North Street, southbound, with Franklin Street, westbound. This was to provide for the rerouting of the Hudson and Allen line, thus bringing it within a short distance of the business center. It was necessary to set the curb back at this location. Seven-inch, 140-lb. A.E.R.A. guard rail was used, with iron-bound and hard-center construction. The spirals were A.E.R.A. standard switch spirals. This company has adopted the 5.3 and 10.0 spirals as standard.

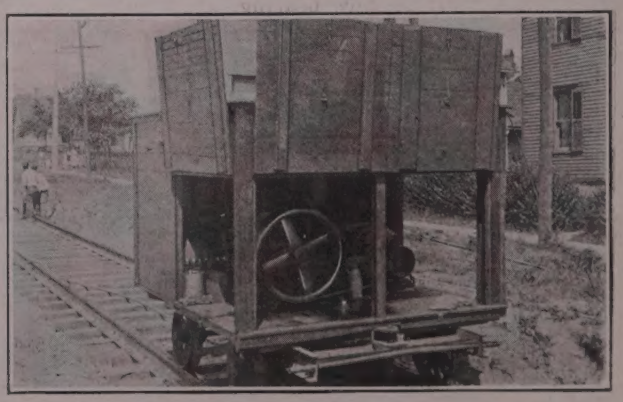
The largest reconstruction job this year was that on East Main Street. The old construction was open track on the side of the street, using 70-lb. A.S.C.E. T-rail. The new construction is standard paved construction in the center of the street. In this case the new track was constructed without disturbing the old one, thus taking care of the regular traffic and the work-train service. Brick pavement was laid on this job.

As the 70-lb. T-rail removed from Main Street was not badly worn, although it had been installed in 1907, it was used to replace a lighter-weight T-rail in open track on the Charlotte line, which rail had been in use since 1888.

The excavation on all the reconstruction work done this year was made with a ½-yd. Thew electric shovel. A Koehring ½-yd. electrically operated concrete mixer was used, and the tamping was done with an Ingersoll-Rand four-tool pneumatic tie tamper. Automatic dumping work cars made by the Differential Car Company were used in handling material.



Type of Concrete Mixer Which Is Used on All Construction in Rochester



Four-Tool Pneumatic Tie Tamper Used in East Main Street Construction

Reducing Lubrication Costs

Methods of Lubrication and Amount of Lubricant Used on Various Types of Motor and Journal Bearings on the Rolling Stock of the Northern Texas Traction Company and Tarrant County Traction Company, Fort Worth, Tex.

By H. M. Robinson

Mechanical Engineer Northern Texas Traction Company, Fort Worth, Tex.

IN THIS description of methods used by the Northern Texas Traction Company for lubricating armature, axle and journal bearings specific information will be given regarding the amount of lubricant applied to different bearings, the interval between lubrication and the methods used for applying the lubricant.

The electric car oil used by the Northern Texas Traction Company is furnished by the Pierce Oil Corporation. It is a straight mineral oil, the summer grade being used about seven months of the year and the winter grade for the remaining five months.

The cost per thousand car-miles for the three divisions of the company is shown in the accompanying graphs, Fig. 2. This includes all lubricants for rolling stock, including trolley wheel and air compressor lubrication, over a period of twenty-six months. The record for the twelve months, September, 1920, to August, 1921, is typical of the experience before the installation of the present methods of lubrication. The graphs for the fourteen months from September, 1921, to October, 1922, show the results obtained in reduced costs by the present system and schedule of lubrication.

Fig. 1 shows the cost of rolling stock lubrication per thousand car-miles for all divisions and includes trolley wheel and air compressor lubrication for the twenty-six months, September, 1920, to October, 1922, inclusive. There is a decided reduction in the lubrication costs under the present schedule of lubrication, the city division averaging between 8 and 9 cents per thousand car-miles, the Fort Worth-Dallas Interurban averaging between 21 and 22 cents per thousand car-miles, and the Fort Worth-Cleburne Interurban averaging between 20 and 21 cents per thousand car-miles.

When it was decided to tackle the problem of reducing lubrication costs our first step was to advise the car oilers as to what we intended to do. A schedule of lubrication was laid out and the oilers were fully instructed as to the proper method of packing each type of bearing. Previous to this time, the oilers used their own discretion as to the amount of lubricant that should be applied to any bearing. The oilers were also given new Acock oil cans, manufactured by the Handlan-Buck Manufacturing Company, St. Louis, Mo., and new Alemite grease guns, manufactured by the Bassick Manufacturing Company, Chicago, Ill., and they were instructed to apply to the various bearings the amount of lubrication as called for in the schedule. If in the oilers' opinion the schedule required varying they were instructed to notify the foreman in charge, and the foreman acted according to the circumstances.

One big thing was to find out how much lubricant was needed for each type of bearing, so that it would

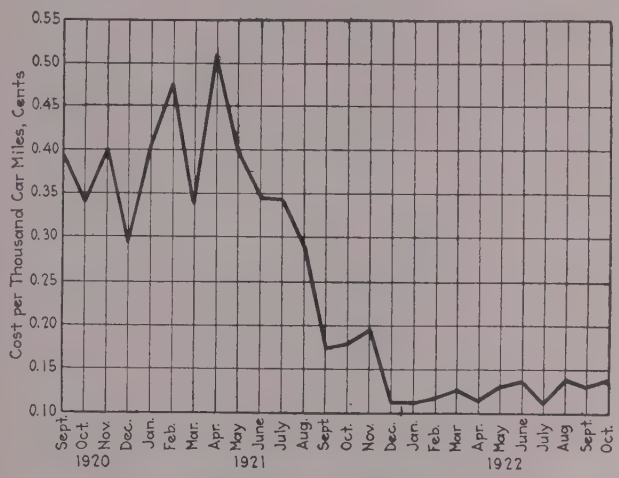


Fig. 1—Cost of Rolling Stock Lubrication per Thousand Car-Miles for All Divisions

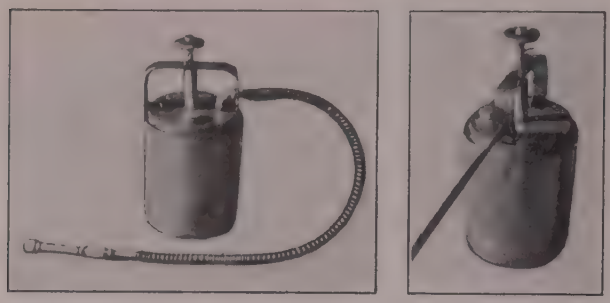
be well lubricated from one inspection to the next. This was determined upon by experimenting. In order to play safe, we allowed enough lubricant per bearing so that it could run about 200 car-miles more than it was supposed to run between inspections.

After the amount of lubricant was determined upon, it was necessary to supply the oilers with a device that would accurately measure the quantity and deliver the lubricant direct to the bearing. The Acock oiler, with a few modifications to suit our particular purpose, solved the problem.

The oil is delivered to the motor and axle bearings of all motors by means of a 1-gal. capacity Acock

AMOUNT OF OIL NEEDED FOR CARS ON REGULAR INSPECTION
FORT WORTH DIVISION (CITY CARS), NORTHERN TEXAS TRACTION COMPANY, FT. WORTH, TEX.

Car Numbers	Type Motors	No. of Motor Bearings	Amount of Oil for All Motor Bearings	No. of Axle Bearings	Amount of Oil for All Axle Bearings	No. of Journal Bearings	Amount of Oil for All Journal Bearings	Total Amount of Oil to Be Issued for Hose Can for This Type Car	Total Amount of Oil to Be Issued for Journal Can for This Type Car
67 to 77 inclusive....	GE 54, 81	8	4 gills	8	4 gills	8	6 gills	2 pints	1½ pints
80 to 91 inclusive....	GE 203	4	3 gills	4	3 gills	8	6 gills	1½ pints	1½ pints
120 to 129 inclusive..	GE 81	4	2 gills	4	2 gills	4	4 gills	1 pint	1 pint
130 to 175 inclusive..	GE 54, 52, 81	4	2 gills	4	2 gills	4	4 gills	1 pint	1 pint
204 to 207 inclusive..	GE 219	4	3 gills	4	3 gills	8	6 gills	1½ pints	1½ pints
203 and 208.....	GE 52, 54	8	4 gills	8	4 gills	8	6 gills	2 pints	1½ pints
213 to 235 inclusive..	GE 219	4	3 gills	4	3 gills	8	6 gills	1½ pints	1½ pints
236 to 239 inclusive..	GE 203	4	3 gills	4	3 gills	8	6 gills	1½ pints	1½ pints
240 to 249 inclusive..	GE 201	4	3 gills	4	3 gills	8	6 gills	1½ pints	1½ pints
501 to 550 inclusive..	GE 258	4	grease	4	2 gills	4	grease	.....	½ pint
551 to 585 inclusive..	GE 258	4	grease	4	2 gills	4	2 gills	.....	1 pint



Left—Positive Oil Can with Hose Connection for Lubricating Armature and Axle Bearings. Right—Positive Oil Can with Connection for Oiling Journal Bearings

positive oil can, having a rubber hose 6 ft. long. At the delivery end of the hose is a check valve so built that the oil will flow through the check valve only when pressure is applied to the piston of the oiler, otherwise the oil would run out and be wasted. One push downward on the piston of this positive oil can delivers ¼ gill of oil to the bearing.

The same type of can is used for journal oiling but this has a ⅛-in. pipe 12 in. long with three holes spaced respectively 1, 2 and 3 in. from the extreme end of the pipe, so that the oil will be delivered over the entire length of the journal.

Previous to the use of this system of lubrication, the oilers were allowed to take whatever quantity of lubricants they thought they would need for their day's work. As the oilers were not required to account for the lubricants used, the method was wasteful and loose.

All rolling stock on this property was also divided into groups, depending on the type of motors used. The quantity of car oil necessary to lubricate one car in each group was determined and this was further divided to indicate how much of the oil should be used out of the journal oiling can and how much should be used out of the motor and axle bearing oiling can or, as we commonly say, "the hose can."

This classification is as shown in the accompanying table. In the afternoon, when the master mechanic's office makes up the list of cars which will be inspected the next day, the clerk also makes up a lubrication requisition, calculated from the table. The next morning the oilers receive from the storeroom the exact amount of lubricants called for by the requisition. The oiler is expected to lubricate all cars on regular inspection with the lubricants given to him. If he does not do so he is called on by his foreman to explain. Of course, if the oiler requires extra lubricants for some extra work, other than the regular inspection cars, another requisition is issued to the oilers for the extra lubricants required.

The table shown is for the city division and similar tables are in use by the two interurban divisions, and the oilers are controlled in the same manner.

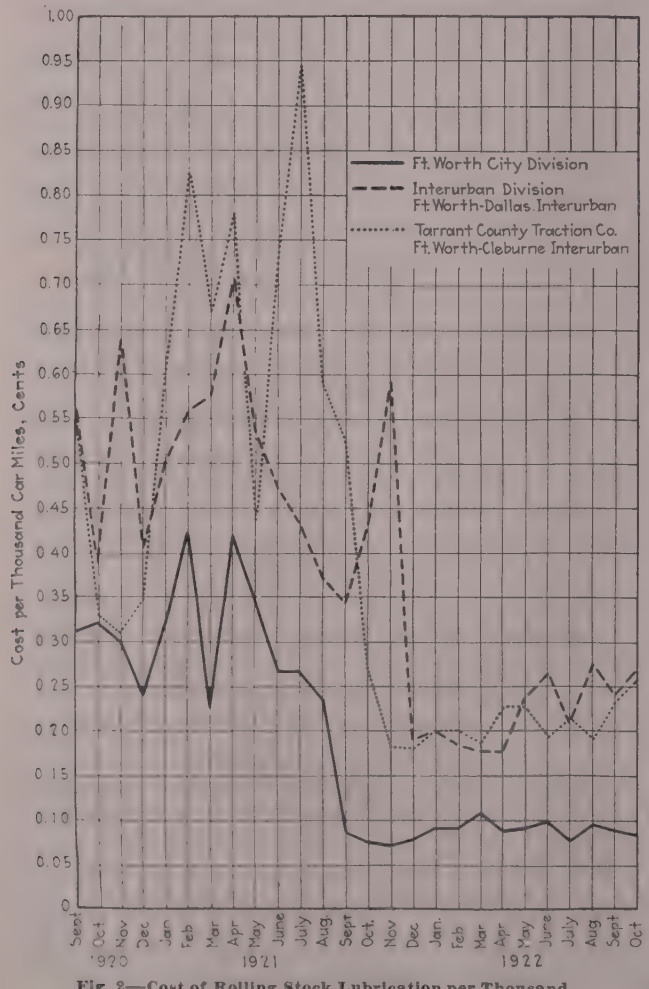


Fig. 2—Cost of Rolling Stock Lubrication per Thousand Car-Miles by Divisions

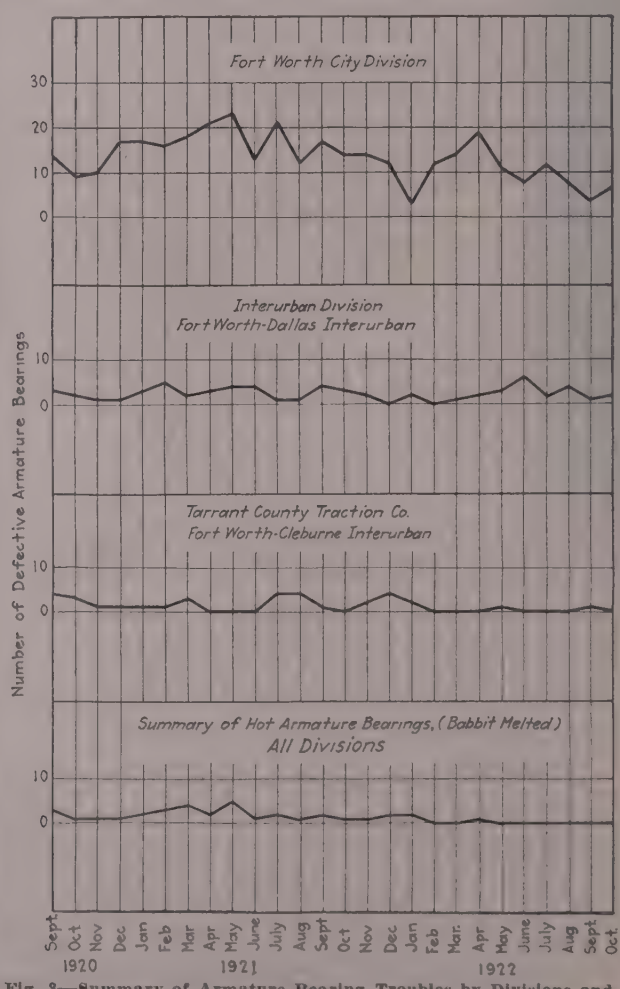


Fig. 3—Summary of Armature Bearing Troubles by Divisions and Chart of Hot Armature Bearings for All Divisions

At Left, Pinion End Lubrication Connection for GE-258 Motor. In Center, Lubricating a Motor by Means of the Grease Gun. At Right, Commutator End Lubrication Connection for GE-258 Motor

The new system of lubrication has been in effect on the Fort Worth city division since September, 1921, on the Fort Worth-Dallas interurban since December, 1921, and on the Fort Worth-Cleburne interurban since October, 1921, and has shown a decided saving. The company now spends about $1,000 a year for rolling stock lubricants instead of $3,000 a year, as under the old system, thus effecting a direct saving of about $2,000 per year.

Another saving has resulted from the decreased amount of work thrown on the mechanical department, due to hot bearings, armatures rubbing the pole faces, etc., and it is significant that since the present system of lubricating has been in effect the number of bearing failures of all kinds has decreased materially. This is shown by the graphs in Fig. 3, which are typical. Better service has resulted from the elimination of hot boxes, and no one can estimate the value of this in dollars and cents.

The costs per thousand car-miles, as given in the graphs, are calculated from the costs of all lubricants used on the rolling stock, which includes electric car oil, air compressor oil, compressor grease, and gear lubricant. The costs per thousand car-miles does not

Oiling Schedule for Cars of the Northern Texas Traction Company

MOTORS—CITY CARS

GE-52 and GE-54 Motors

ARMATURE AND AXLE BEARINGS

Packing—Take a piece of wool felt 2 in. square by ⅝ in. thick, and split it for 1½ in. Place the ⅝-in. end in the slot in the shell so that it touches the shaft and bend the wings of the felt over the bottom of the shell. Place a layer of wool waste about 1 in. thick on top of the felt wings, then pack the remainder of the box with cotton waste, leaving room at the top for a piece of wool felt, which should fit tightly in the top of the box. Leave about ½ in. from the top of the box to the top of the felt, as this space is necessary for the oil.

Oil—Oil on a basis of 1,000-car-miles for regular inspection, using ½ gill of car oil to each armature and axle bearing.

GE-81 Motors

ARMATURE BEARINGS

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of 1,500 car-miles for regular inspection, using ½ gill of car oil to each armature bearing.

AXLE BEARINGS

Packing—Pack exactly the same as the bearings on GE-52 and GE-54 motors.

Oil—Oil on a basis of regular inspection every 1,500 car-miles, using ½ gill of car oil to each axle bearing.

GE-219 Motors

ARMATURE BEARINGS

Friction, Side Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 1,500 car-miles, using ¾ gill of car oil to each armature bearing.

AXLE BEARINGS

Friction, Bottom Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 1,500 car-miles, using ¾ gill of car oil to each axle bearing.

GE-201 and GE-203 Motors

ARMATURE BEARINGS

Friction, Side Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 2,000 car-miles, using ⅝ gill of car oil to each armature bearing.

AXLE BEARINGS

Friction, Side Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 2,000 car-miles, using ¾ gill of car oil to each axle bearing.

GE-258 Motors

ARMATURE BEARINGS

Ball Bearing

Oil—At the beginning make sure that the bearings are full of compression grease. Then thereafter at each regular inspection (2,000 car-miles) give the grease gun four complete turns to each bearing, thus injecting ⅔ ounce of grease into the bearing. This ⅔ ounce of grease replaces the amount of grease that leaks out or is used up between inspections.

AXLE BEARINGS

Friction, Side Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 2,000 car-miles, using ½ gill of car oil to each axle bearing.

INTERURBAN MOTORS

WH-56 Motors

ARMATURE BEARINGS

Packing—Place a piece of wool felt ⅝ in. thick over the bearings. This is fitted into a slot in the shell so as to remain in place. Place a layer of wool waste about 1 in. thick over the bottom of the box, then pack the remainder of the box hard with cotton waste, leaving room at the top for a piece of wool felt which should fit tightly in the top of the box. Leave about ½ in. from the top of the box to the top of the felt, as this space is necessary for oil.

Oil—Use ½ gill of car oil once every twenty-four hours on each armature bearing.

AXLE BEARINGS

Packing—Same as armature bearings.

Oil—Use ½ gill of car oil once every twenty-hour hours on each axle bearing.

WH-76 Motors

ARMATURE AND AXLE BEARINGS

Packing—Same as WH-56 armature and axle bearings.

Oil—Use ½ gill of car oil to each armature and axle bearing once every forty-eight hours.

GE-73 and GE-240 Motors

ARMATURE BEARINGS

Friction, Side Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 1,500 car-miles, using 1 gill of car oil to each armature bearing.

AXLE BEARINGS

Friction, Side Feed

Packing—Pack entirely with wool waste.

Oil—Oil on a basis of regular inspection every 1,500 car-miles, using 1 gill of car oil to each axle bearing.

JOURNAL BEARINGS

City Cars

FRICTION BEARINGS

Friction journal bearings are oiled at each regular inspection of the car according to the needs of the box, but not more than ½ gill of car oil should be put on each side of the journal bearing at one oiling.

BALL BEARINGS

Grease at each inspection of the car every 2,000 car-miles. Force grease into the box until grease shows up at the plug hole at the top of the box.

On the average 2 ounces of grease at each inspection will replace the grease that leaks out or is used up.

Interurban Cars

FRICTION BEARINGS

Pack with wool waste. Oil at each regular inspection according to the oilers' discretion, but not more than ¾ gill of car oil should be put on each side of the journal bearing at one oiling.

GEARS

City Cars

Gears on all types of city equipment are examined at each regular inspection and from 3 to 4 ounces of gear lubricant is applied.

Interurban Cars

Gears are greased at each regular inspection according to needs, but not more than 6 ounces of gear lubricant is applied at one time.

include the cost of wool packing, felt, cotton packing, or the labor necessary to do the oiling.

The Fort Worth city division averages more than 500,000 car-miles per month, the Fort Worth-Dallas interurban averages more than 150,000 car-miles per month, and the Fort Worth-Cleburne interurban averages more than 40,000 car-miles per month.

The method used and schedule of oiling for the city and interurban cars on this property is given on page 121.

In repacking the city and interurban cars on this property, the packing is pulled out of all armature, axle, and journal bearings. It is then culled over and the best is used in repacking journal boxes. If there is not sufficient good old packing with which to repack the journals, the deficiency is made up by using new wool packing in the journals.

When repacking journal bearings, care is taken that none of the waste hangs out of the box, as waste in this position acts as a wick and will drain the oil out of the box. All motor and axle bearings, with exceptions as noted, were repacked with wool waste made by O'Neal Brothers, Inc., Philadelphia, Pa. The wool waste is soaked twenty-four hours and drained twenty-four hours, thereby leaving approximately 3 pints of oil to each pound of waste.

Cotton waste is soaked twenty-four hours and drained twenty-four hours. Felt is soaked twenty-four hours and drained until used, as felt will retain the oil even when left on the drain board for ten days.

In repacking armature and axle bearings with wool packing, the packer is careful to pack the waste moderately tight into the bearing, up against the revolving part of the axle. If the waste is not tightly packed it will settle away from the revolving part and cause a stoppage of the oil from the bearing.

Accompanying illustrations show the system adopted for greasing the ball bearings of our GE-258 motors. This is a modification of the Alemite lubricating system. Grease connections are added to each end of the motor as shown. These are raised high enough so that the grease gun can be applied easily through the trap-doors of the car.

Nitrogen-Filled Transformer Case

A NEW principle in transformer design has been incorporated in a 25,000-kva. bank of power transformers under construction by the Westinghouse Electric & Manufacturing Company for the Middle West Power Company, Sargent & Lundy, consulting engineers. The new principle consists in filling the transformer case above the oil level with nitrogen. This is produced in an automatic generator attached directly to the transformer tank. The generator keeps the space above the oil level always full of the protective nitrogen.

The protective layer of inert gas above the oil level acts as a cushion or buffer to take the shock of any sudden pressures that develop under the oil level if there should be a short circuit or any defect in the transformer windings. The gas is easily compressed and it is enough of a buffer to take the brunt of the explosive pressure and save the tank from injury. The inert gas protects the oil against both air and moisture, and claims are made that oil used under the nitrogen will even improve with age.

The transformers for this Illinois installation will be the first of this type to be built.

The Readers' Forum

Progress and Prospects in Electric Railway Engineering

THE CLEVELAND RAILWAY COMPANY
CLEVELAND, OHIO, Jan. 10, 1923.

To the Editors:

Referring to your review in the Jan. 6 issue it seems to me that during the past year no particular instance of greater advancement is found than that accompanying the development and adoption of automatically controlled substations and water-wheel plants. This type of equipment has reached a point of perfection where its reliability is no longer questioned, as is shown by the serious consideration being given to it by a number of the large properties where continuity of service is the prime necessity.

The coming year should witness a much greater development and corresponding increase in the number of installations, particularly because the issues involved in the adoption of such equipment are much better defined and more generally understood than heretofore.

There has also been evidenced, during the year, a tendency toward determination of standards regarding systems for use in electrification of steam railroads of various types. This is, indeed, significant, and it is hoped that progress will continue along these lines, removing the many differences of opinion existing, so that much greater activity may be registered in this particular field in the very near future.

Electric power at lesser cost is of vital importance to the industry as a means of meeting increasing competition. There are several methods which are now being utilized with more or less success for the production and distribution of small blocks of power. Reference is made to the possibility of utilizing numerous small automatic water-wheel plants, located upon unnavigable streams, all plants being arranged to feed into a common transmission system. Further development of the mercury arc rectifier or the vacuum tube may be possible also, rendering these devices applicable to conversion of energy on a larger scale and at a reduction in cost over present methods.

L. D. BALE,
Superintendent of Substations.

Nickel-Chrome Steel for Special Trackwork

NEW YORK, Jan. 15, 1923.

To the Editors:

I have read with interest the engineering review appearing in the issue of the ELECTRIC RAILWAY JOURNAL for Jan. 6. There is just one point in connection with this review where I see a possibility of a misleading impression being given, namely, in the paragraph where the use of nickel-chrome steel in special trackwork is referred to.

It seems to me that the installations of this steel are so far entirely of an experimental character and represent an endeavor to prolong special trackwork life by means of repairs through welding. Not sufficient of this work has been in use long enough to determine its ultimate life and the maintenance cost in comparison with manganese steel and other constructions.

"ENGINEER."

Equipment Maintenance Notes

Dayton City Railway Remodels Cars for One-Man Operation

The Program for Reconstructing Double-Truck Cars for One-Man Operation Will Require an Expenditure of Approximately $175,000—Some New Trucks and Motors Will Be Used

THE City Railway of Dayton, Ohio, is remodeling all of its old double-truck cars for one-man operation. There are fifty-six of these cars and they can be classified into four general types. In the first class are fifteen class 100 double-truck cars built by the Barney & Smith Company of Dayton, Ohio, in 1906. These cars have Barney & Smith class I maximum traction trucks and two GE-57 type motors. The cars weigh approximately 34,000 lb., and have cross seats, with an aisle 20 in. wide, which is too narrow for present service conditions. The cars also have Cooper hot water heaters.

In the remodeling of these fifteen cars the trucks and motors are being retired, and in their place will be used fifteen equipments of 0-36 Standard Motor Truck Company's maximum traction trucks each equipped with two Westinghouse No. 306 motors. These trucks and motors are at present in use under some steel cars which will also be remodeled, as referred to later.

In order to obtain an aisle of greater width the seating arrangement is being changed. Six cross seats are removed from the right-hand side looking forward and six from the left-hand side in the rear. Longitudinal seats are installed in their place for the same distance as was occupied by the cross seats. This gives a staggered seating arrangement with cross seats opposite each longitudinal seat and so gives a much greater aisle width. As Gold electric heaters are to be used in place of the hot water heaters, the hot water heater and the front bulkhead are removed and two additional cross seats are added on the forward left-hand side, in place of a short longitudinal seat which was necessary with the old arrangement. The old seating arrangement provided a seating capacity of forty-eight, and a very small additional standing room on account of the narrow aisle. With the new arrangement the seating capacity will be the same, but there will be considerably more standing room.

A turnstile is installed on the rear platform, and as these cars are arranged for single-end operation with narrow platforms at the rear, additional seats cannot be installed on them. The folding doors used are operated by National Pneumatic Company's standard equipment,

Car Remodeled for One-Man Operation in Service in Dayton

which is controlled by the operator from the front end of the car. Other equipment and appliances are the same as for the new cars recently placed in service, and described in the ELECTRIC RAILWAY JOURNAL for Oct. 28, 1922. The total weight of the cars as remodeled will be approximately the same as previously. The different type of truck decreases the weight somewhat, but the additional equipment installed just about makes up for this.

New Trucks and Motors Will Be Used

The second class of cars being remodeled consists of twenty all-steel cars which have Standard 0-36 trucks. Trucks from fifteen of these cars will be used under the class 100 Barney & Smith Company's cars just referred to. New trucks will replace these, which are made by the Cincinnati Car Company and consist of its standard arch-bar combination elliptic and coiled spring type of truck. Each truck has two GE-264 motors, which give a total of four motors per car. The cars have K-35-HH control and Westinghouse air brakes. The roofs of these cars consisted of steel over cork. This type of construction has not proved satisfactory, as the roof has deteriorated after being in service only ten years. New wooden roofs will be placed on these cars. The other five cars of this class will retain their present trucks and equipment but will be completely overhauled and will have new roofs, new brake rigging on the trucks and will have the additional equipment such as heaters, mirrors, buzzers, fare boxes and the like installed, as required for one-man operation.

The turnstiles used on these cars are mounted just inside the body in a position quite similar to that on the new cars previously referred to. Originally these cars had a rear drop platform. This is rebuilt so as to bring the platform floor flush with the car floor. A small well is retained with an exit step and passenger seats are provided around the end.

The former seating capacity of these cars was forty-four. By eliminating a short longitudinal seat where the turnstile is installed and by adding seats on the rear platform a seating capacity of forty-six is obtained. The former weight was 32,000 lb. By substituting the arch-bar truck with four 25-hp. motors of the Standard 0-36 trucks and Westinghouse No. 306 motors, and by replacing the hot air heater with electric heaters, a saving in weight of 4,000 lb. is obtained, so that the remodeled cars will weigh but 28,000 lb.

The third class of cars being remodeled consists of ten steel cars, which are of a slightly different type than the second class. They are equipped with Standard 0-45 maximum traction trucks and Westinghouse No. 306 motors. The length of these cars is also different from the steel cars previously referred to. The reconstruction of these cars will require about the same work as for the other steel

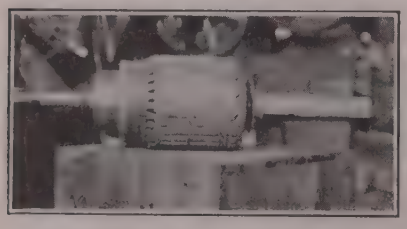
cars except that the original steel roof will be retained, as it is at present in fair condition and does not warrant replacing. All the equipment will be carefully overhauled and the rear platform will be built out and seats provided in a manner similar to that for the other steel cars.

The fourth class being reconstructed is eleven double-truck cars with wooden bodies. These are equipped with Standard 0-45 trucks and Westinghouse No. 306 motors. They are being rebuilt by the Oakwood Street Railway of Dayton in its shops for one-man operation with similar arrangement and equipment as described for the steel cars just mentioned. The old seating arrangement provided a capacity for forty-eight passengers. With the improvements this will be increased to fifty-two. Seven of these cars have already been completed and are now in service.

All material for this remodeling and reconstruction has been ordered and amounts to approximately $175,000. The work is progressing rapidly and it is thought that by March, 1923, the road will have 100 per cent one-man operation with as fine and up-to-date equipment as any similar road in the country.

Broken Compressor Shafts Welded Cheaply

BROKEN compressor armature shafts are not replaced but welded in the Elyria shops of the Cleveland, Southwestern & Columbus Railway. The breaks usually occur where the shafts have been turned to a smaller diameter to receive the



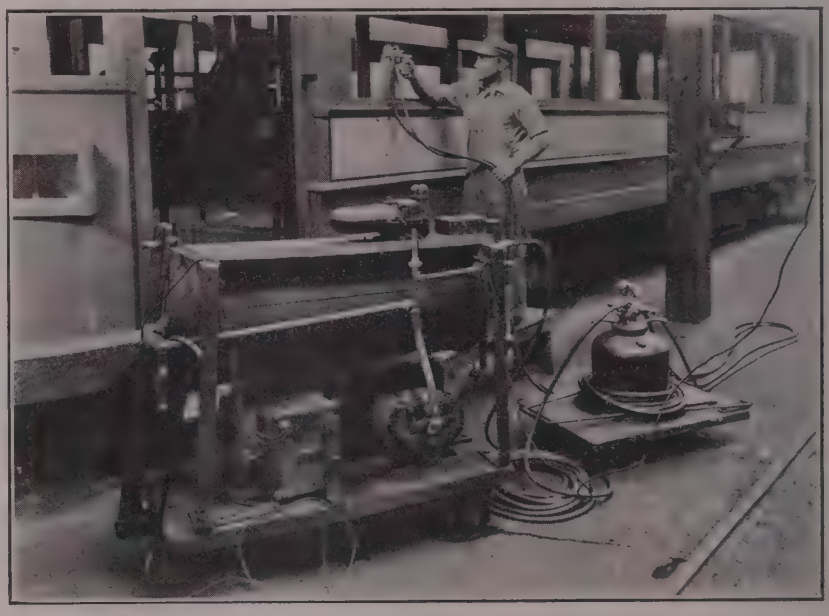
Broken Compressor Shaft Repaired by Welding

pinion. The end of the broken shaft is turned to a point as is the practice with new stock, which is ¼ in. larger in diameter than the shaft. The armature is centered on the tail stock of a lathe with a rest under the shaft near the point to be welded and the new piece is centered and held in the chuck. The welding material is then melted into the V-shaped gap with a gas flame as the armature is slowly rotated.

The cost of making such a weld alone is about $1 and it is estimated that the machining costs slightly more than $1. After the job is finished it is impossible to detect any sign of the weld. This same method is used whenever possible in repairing main motor shafts since the removal of the shaft would necessitate the stripping of the armature.

Home-Made Portable Compressor Outfit for Paint Spraying

THE accompanying illustration shows a portable compressor outfit constructed in the shops of the Grand Rapids (Mich.) Railway. It consists of a three-wheeled truck on which are mounted a compressor, air reservoir, governor and necessary switches, fuses and strainer.



Shop-Constructed Portable Compressor Outfit for Paint Spraying

The compressor is mounted directly on the wooden platform at the bottom and the air compressor reservoir is installed directly over this and supported by a strap-iron framework. A board on top of this framework serves for holding the governor and switch which is connected in the compressor circuit. As dry air is quite necessary for paint spraying, particular precautions have been taken in this respect, and a strainer is installed between the compressor tank and the connection to the paint-spraying equipment. The piping is also provided with a drain with a pipe connection at the bottom to form a pocket for receiving any water. The reservoir also has a drain cock at the bottom.

The electrical connections are made by having a lead from the compressor switch attached to a hook on a long pole so that this can be hooked over the trolley wire as desired. The ground connection is made by a flexible lead to a clamp which is attached to the track. All of the equipment used was obtained from a dismantled car. The arrangement is very compact and can be readily hauled about the shop by one man and can thus be placed in any location convenient for spray painting.

Good Scheme for Keeping Shop Neat

THE Fall River division of the Eastern Massachusetts Street Railway has considerably rearranged the maintenance shops at Fall River. Here light repairs are made, oiling is done, etc. In the pit shop where the inspection and light overhaul work is done a successful and economical plan of keeping the place looking neat is used.

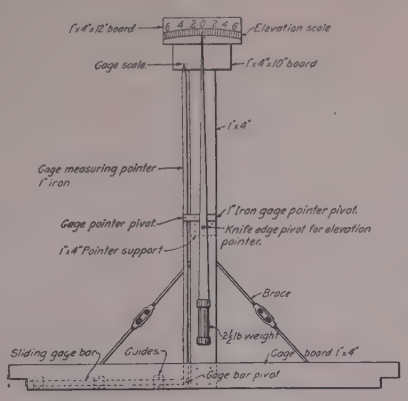
The shop is divided into areas, and each man is assigned to one of these. It is his duty to see that the floor and equipment within his area are

in first-class shape when work starts in the morning. The areas are not so large but that the cleaning up can easily be done during the fifteen-minute period allowed for this purpose in the morning. The work is done in the morning rather than at night because experience has shown that it is done better when the men are fresh rather than when they are tired at the end of the day's work and are anxious to get home to supper.

In order that there may be no difference of opinion as to the territory assigned to each man, a chart is posted showing the boundaries of each area and the name of the man assigned to take care of it.

Device for Gaging Track and Determining Elevation

HIGH-SPEED interurban roads require frequent inspections of curves to make certain that the track gage and elevation are within the limits desired. With the usual form of track gage and a common level, considerable stooping is necessary by the man doing the work, and various devices have been produced to make this inspection easier and less trying. Among the home-made devices used is one by C. S. Lusk, section foreman of the Erie Railroad, which was described in a recent issue of *Railway Maintenance Engineer*.



Combination Track Level and Gage Board

The device includes both a track gage and a level, and except for a few strips of iron and the bolts that are necessary for fastening the parts together, the machine is made of 1-in. x 4-in. boards, and weighs but 12 lb. An accompanying illustration shows the construction of this device, which consists of a wooden cross-piece or gage board with a vertical standard or upright fastened to this. Two pointers are mounted on the upright, one for measuring the elevation and the other for measuring the plus gage of the track. The gage board is notched at the end to fit the rail head and has a sheet-iron band to protect it from wear. On the back side of the gage board is a bar of iron which works in guides and has a movement along the gage board. The inside end of this bar is connected by a pivot to the vertical pointer. This pointer is pivoted at the center and by pulling the top end until the bar on the gage board engages the rail head a reading can be obtained of the number of inches as marked on the scale board.

The pointer for measuring elevation is approximately 4 ft. long and is kept plumb by a 2½-lb. weight attached to the lower end. In order to provide a pivot which will work without appreciable friction, the pivoting bolt is filed to a V shape and the hole in the pointer is bushed with a thin iron bushing. An elevation scale at the top enables the operator to read the elevation conveniently as soon as the pointer comes to rest. The scale is divided so as to show the elevation in inches.

Jones Gets Some Pertinent Pointers on Housekeeping

THE face of the machine shop foreman on the Jinxville Electric Railway property wore a frown that morning as he sauntered sullenly in front of the lathes where his men were turning up bearing shells for Westinghouse 69 and GE 73 motors. "S'matter, Bill, you're darn glum this mornin'. Anybody sick at home?" spoke out "Whistling Dick" Singer, one of the old timers who was a warm personal friend of Bill Jones, the foreman.

"Nothin' wrong at home, I'm glad to say, Dick, thanks. Fact is the boss just had me on the carpet about the looks of this here shop. He says it's a disgrace the mussy way the machines look. And the floor, he says, looks as if it hadn't been swept in a month. The old place looks good enough to me. You don't expect a railway machine shop to look like a front parlor on a Sunday mornin'."

"No, Bill, you don't, but I've wished for a long time you'd have the shop kept neater. I hated to mention it, for fear you'd think I was buttin' in. Fact is, Bill, you ought to change the way machines are used around this shop. Now, bein's the boys kind o' look up to me they've let me hang onto this 12-in. lathe right along. It's the only one in the place that's true. I can get good work out of it. I try to keep it clean and I keep that old box underneath to catch most of the turnings off those bearings. Most of the fellows, however, work on any one of the machines they need and they use it for a time, then shift to another one. They don't give a rap whether they leave it lookin' neat or not. Say, you did a good thing when you put Ole Olson on that radial drill three months ago. That shows what having your own machine will do for a fellow. That guy loves that machine like a baby. He cleans it up every night; and did you notice he puts boards on the bedplate under the motor shells, so the bedplate won't get scored? Some careful lad, I'll say; but I believe it pays."

"Wait a minute, Bill," continued Dick, as Bill made as if to move on a little impatiently. "While I'm suggestin', if I was you I'd give each careful man a machine of his own as far as you can and make him responsible for it. Give him a word of compliment now and then if he keeps it neat. He'll take real pride in it, and the machine will last years longer. And say, Bill, jack that dago sweeper up so he'll take a little more care of the floor. I believe we'd all get more fun out of our work and do it better, too, Bill, if the place looked trimmer. Think it over. No offense, I hope, Bill?"

"Sure not, Dick, old top; you said something. Open your head whenever you feel like it, Dick. I've got to do something to please the boss, anyhow. Maybe you've got the right dope."

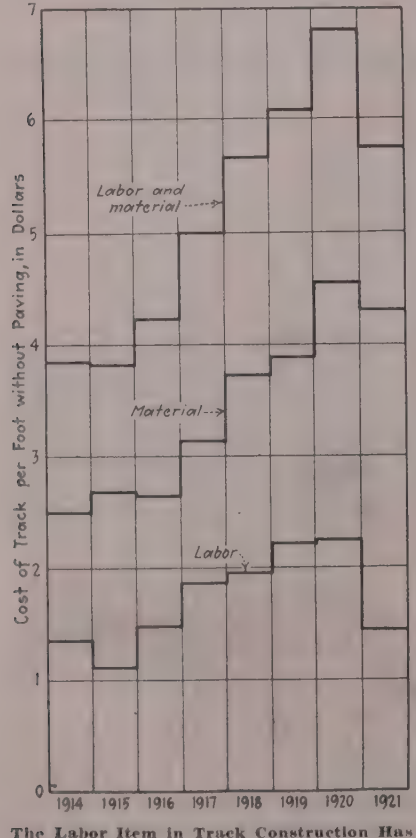
"By the way, Bill, the road's making a little money now. Wonder if you could get the boss to buy some new machines and get rid of these antiques. They take about three times as long to do a job as they ought to and it isn't right when you get done."

"I don't know, Dick. I might try the old man again, after we get the shop cleaned up so he'll be a little sweeter. Maybe he could get the G. M. to O. K. a purchase order now. Heaven knows we need some new machines. That's why I ain't had no heart to doll up these old relics."

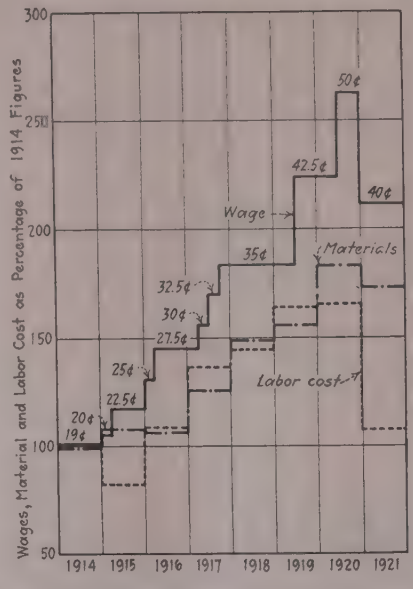
Labor-Saving Machinery Shows Economies

THE results of the use of labor-saving machinery, devices and methods in track construction by the Cleveland Railway are shown in the accompanying charts. One graph is based on the actual cost per foot of track construction, and the other shows the percentage change in the wage scale and material and labor costs by years since 1914. The latter curve indicates that the employment of labor-saving methods and machinery helped materially to hold the labor costs within reason in spite of a rapidly mounting wage scale. The curve also indicates that the labor costs as an average over the entire period were held down to about the same increases as took place with materials. While little could be done to reduce materials expense, it is seen that the utilization of new devices as they were developed was effective in smoothing the wage scale peaks from the labor cost.

Present-day Cleveland track reconstruction tactics include the use of plows for tearing up paving. This method has eliminated the necessity of employing a large gang of men



The Labor Item in Track Construction Has Been Reduced by Use of Modern Equipment



Actual Labor and Material Costs for Track Construction in Cleveland

and as a result has reduced that item of cost from a considerable to a negligible proportion of the total. Cutting out old rail with gas torches has likewise been a great aid in saving labor and time. The further economies are largely the benefit derived from the use of larger and better equipped work trains, steam shovels, concrete mixers, gravel conveyors, etc.

Nicks in Trolley Wire

MANY linemen have a custom of nicking the trolley wire when they wish to renew a frog, crossing or other casting supported from it. This is usually done with their pliers so as to mark the exact location of the old casting and to permit installing the new one in the same place.

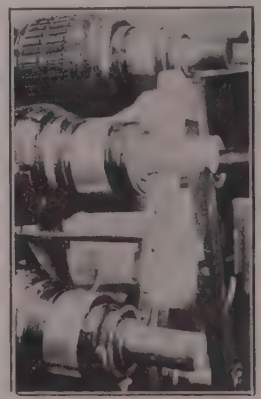
This is bad practice and should not be permitted. Copper wire is weakened greatly by a very small nick or even a scratch and is much more liable to break where it has been nicked than at any other place. Copper wire manufacturers have experienced difficulty from this and when copper wire is tested at the mill the manufacturer insists that the inspector take samples for testing from a point several feet from the end of the reel, preferring to scrap a number of pounds of wire rather than to take the chance of getting a poor sample that has been damaged by scratches when being coiled on the reel.

While this nicking is detrimental to any copper wire, even if soft-drawn or alloyed, it is most harmful to hard-drawn wire, which is the kind used for trolley wire on all roads except those using some of the special alloyed wire. The "skin" of a hard-drawn wire is much harder and stronger than a like area of the same wire inside of this outer coating, and once the hardened portion has been cut through, the wire beneath is but little stronger than soft-drawn wire.

The fact that the nick comes just where the casting is attached to the wire results in the wire being weakest just where it is exposed to the greatest stresses. Most of the vibration of the wire must be absorbed at the castings because of the change from the more or less flexible trolley wire to the rigid casting. The results of the practice of nicking the wire are therefore to reduce greatly the life of the wire and to increase liability of breakage.

Solid End Armature Bearings

THE accompanying illustration shows a type of solid end armature bearing which has been used by the Spokane United Railways for several years and has proved very satisfactory. Trouble was experienced with the usual type of open-end bearings due to the impossibility of keeping sand, grit and like substances out of the bearing and to the difficulty of keeping the oil in. The new type of bearing now used is cast



Solid End Armature Bearings. At Top—Old Type. In Center and at Bottom—New Solid End Type

with a solid end and results show that these require to be re-oiled only about once every 900 miles, whereas the old type required attention about every four days with less than half the mileage. A type of bearing with a screwed-in end was tried, but this also was found unsatisfactory.

New Type Passimeters in New York

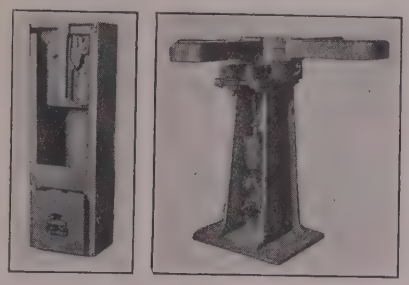
Automatic Passimeters with Coin Box Have Been Tried Out in the Subway Stations of the New York Municipal Railways, and Their Use Is Being Extended

A NEW TYPE of fare collecting and registering passimeter has been installed in several of the stations of the New York Municipal Railway and is proving very efficient for speeding up fare collection and for preventing congestion. The mechanism consists essentially of two units—the coin box and the passimeter. These are installed in the line of entrance of passengers with the coin box in front and the passimeter just beyond, so that passengers on entering deposit their nickels in the slot of the coin box and when recorded the passimeter is unlocked so that entrance is obtained without obstruction. These automatic turnstiles are installed in banks, the number of individual mechanisms depending upon the service requirements at the particular point. Another innovation has been made in the arrangement for collecting fares. Instead of requiring all passengers to obtain change from a change booth and then pass through the automatic turnstiles the change booth is located in such a position that passengers who have not the necessary 5-cent piece for operating the automatic mechanism can pay their fare and then pass through a registering turnstile without the necessity of returning to the other machines.

The turnstiles are designed for use solely as entrance facilities and separate exits are provided at each of the points where the turnstiles are installed. This arrangement serves to divide the incoming and outgoing traffic at each point and eliminates congestion due to the use of the same facility for both entrance and exit purposes at important traffic centers.

The coin box consists of a rectangular sheet-iron housing 37 in. x 12 in. x 12 in. One-eighth-inch sheet iron is used in its construction, and the corners are reinforced with angle irons. The upper portion of the coin box is used for the mechanism necessary for receiving the coins, recording them, and establishing the necessary connections for unlocking the passimeter. The lower part is used for the lock-up receptacle which receives the nickels after they are released by the upper mechanism.

The lock-up receptacle is a new and original design with special features for safeguarding the money received. These receptacles are 12 in. x 12 in. x 12 in., and are provided with a locking mechanism at the top. The receptacles are placed in the opening at the bottom of the coin box with the top opening unlocked and open. The bottom portion is then closed and locked. To remove the receptacle the entrance door is unlocked and the receptacle can then be pulled out. In doing this, however, the receptacle is automatically locked and cannot be opened by any one before it reaches the receiver in the main office, who is the only person with a key for unlocking the receptacles.



At Left—Coin Box. At Right—Passimeter.

The mechanism in the coin box for receiving and registering the fares and unlocking the turnstile is the same as that used in a type of coin box used by the Brooklyn Rapid Transit Company and described in the ELECTRIC RAILWAY JOURNAL for Sept. 9, 1922, except that this mechanism can be operated only by a nickel. The slot for receiving coins, however, will receive both pennies and dimes, but these coins pass through without interruption into a coin receptacle and are thus returned to the passenger without unlocking the turnstile. Provision is also made for returning nickels which may be in such a battered condition that they will not operate the mechanism, or coins which may be deposited while the mechanism is temporarily out of order. A push button is provided in the top portion of the box, and by pushing this the coin is automatically returned to the coin receptacle. The slot in the top of the coin box for receiving fares is of sufficient depth so that two nickels can be deposited at one time and these will permit the entrance of two persons before it is necessary to deposit another fare.

The passimeter consists of a top unit which has four wooden arms. This is mounted on a cast-iron base. The top head carrying the arms is constructed in a unit so that it can be quickly detached and removed for repairs if necessary, and another head reinstalled in its place without delay. The center portion carrying the arms has ball bearings, so that very little pressure is required to rotate the arms. A spring is also provided which assists in the movement of the arms after they have once been started and insures that they rotate 90 deg. to their required stationary position.

The mechanism for unlocking the passimeter and controlling its operation is installed inside the lower cast-iron base. This mechanism is also mounted as a unit, and should it

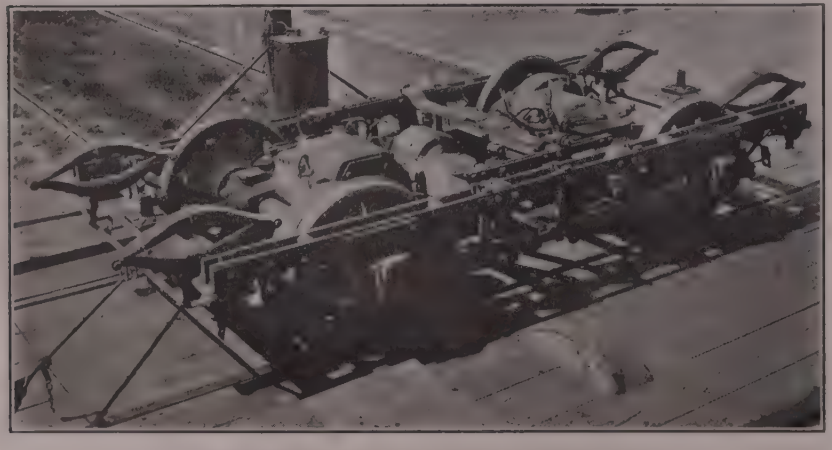
Passimeter with Automatic Coin Boxes Installed in the Thirty-fourth Street and Broadway Station of the New York Municipal Railway

get out of order it can be quickly removed and a new mechanism put in place so that repairs can be made at the shops. The height from the base to the top of the arms is 36 in., and when installed in position a sheet-iron cover is provided across the top and this extends down on the outside so as to provide a smooth surface and thus prevent the catching of clothing, hand bags, and the like, of passengers as they pass through the turnstile. The top unit of the passimeter is arranged to swivel a slight amount in either direction. Rubber bumpers are provided so that should the arms be pushed forcibly, as is frequently the case when passengers are in a hurry, the vibration and strain is taken by these rubber bumpers.

Accompanying illustrations show an individual unit and also a battery of five passimeters as installed in the New York Municipal Station at Thirty-fourth Street and Broadway, New York. The equipment was developed by E. J. Kennedy, superintendent of the railway register department, and the equipment is being manufactured by the Perey Machine Works, Brooklyn, N. Y.

Truck Mounting for Compressor

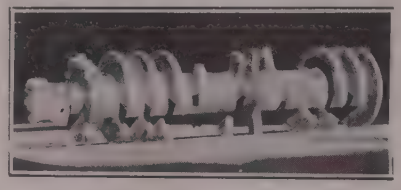
THE mounting of compressors and the installation of air brake equipment on single-truck cars which are to be used for one-man operation often presents quite a problem. It is desirable to keep the overhang at the ends for such cars as short as possible, and there is very little room for the installation of equipment in the center portion of the car. The accompanying illustration shows a method of mounting the compressor on some single-truck cars being converted by the United Traction Company of Albany, N. Y. The compressor is supported by two channel irons which are fastened at each end of the truck sideframe by U clamps. These channels drop down after extending inward about 10 in., so as to provide the desired clearance for the top of the compressor when installed.



Compressor Mounted in the Center of a Single Truck

Kinks in Repairing Controller Drums

MANY of the older types of controller drums were made from a solid piece of brass so that there was no way of renewing the segments burned down by arcing. A number of G. E. C-6 drums of this construction that had been removed from



Curved Strips Form New Contact Surface on Segments of Old-Type Controller Drum

equipment on the Lake Shore Electric Railway, Sandusky, Ohio, because of burned and worn-down segments were again made serviceable by turning all the segments to the same radius in a lathe. They were restored to the proper radius by having curved brass strips, $\frac{1}{4}$ in. in thickness, screwed on. The screw heads were not countersunk but were cut off and the contact surface smoothed up. In some cases more than $\frac{1}{4}$ in. had been burned from the corners of the segments, but no attempt was made to turn off any more than the standard amount. Any gaps between the segments and the new strip were filled in with solder.

Platform Lights for One-Man Cars

A METHOD of providing lights on the platforms of cars operated by one man whenever the doors are open and the steps lowered has been in use on the cars of the Springfield (Mo.) Traction Company for some time. The plan, it is found, reduces boarding and alighting accidents, and the operator is also provided with the necessary light for making change, issuing transfers, etc. The device also serves as an additional safety device so that the operator can tell the instant the doors are properly closed and steps folded, and thus operation can be speeded up.

The additional lighting circuit and provisions for making connections are shown in the accompanying illustration. An additional circuit of five lights is installed, two on one end and three on the opposite end of the

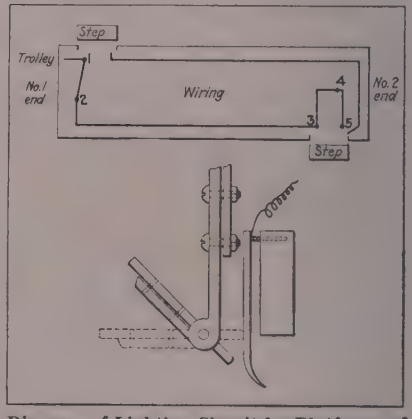


Diagram of Lighting Circuit for Platforms of One-Man Cars—Step Contact Mechanism for Grounding Lighting Circuit

car. These lights are wired in series by tapping on to the positive side of the lighting circuit and by grounding the circuit through contacts operated by the folding steps. In the accompanying diagram the circuit passes through lights 1 and 2 at the No. 1 end of the car and then through lights 3, 4 and 5 at No. 2 end of car. The ground side of the circuit is connected to two contacts, one at each step, so that whenever either step is lowered the ground connection is established.

The grounding contact consists of a spring mounted on a block of wood. As the step is lowered, a small metal portion on the back makes the contact with this spring and establishes the ground connection. Most step mechanisms have a projection which can be used for this connection.

Spring Trolley Ears in Cleveland

IN REPLACING the trolley on a 1,500-ft. section on both tracks of the St. Clair Avenue line, the Cleveland Railway has used No. 0000 grooved wire supported with Drew spring ears. It is intended to extend this type of construction along St. Clair Avenue, which is one of the heavy traffic lines of the city. James Scott, engineer of overhead construction, feels that this type of suspension is the proper one to use for stringing grooved wire and that its merits will soon be found under actual heavy service conditions.

The Drew ear is slotted only deep enough to receive the upper section of the grooved wire so that the trolley wheel does not come in contact with the ear itself. With no irregularity in the lower surface of

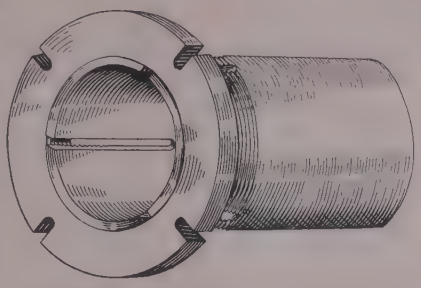
Spring Ear Used on St. Clair Avenue Line, Cleveland

the wire, arcing is practically eliminated when the wire is drawn tight, as is the practice in Cleveland. The spring steel support is also effective as it reduces what might be called the unsprung weight of the overhead. This type of ear was used in the overhead construction on the high level of the Superior Street tunnel and has been in use for about a year.

Self-Centering Chuck for Finishing Motor Bearings

A HOME-MADE chuck to hold motor bearings while they are being bored has proved a time saver in the shops of the Cleveland, Southwestern & Columbus Railway at Elyria, Ohio. The features of this chuck are shown in an accompanying illustration. The bearings are automatically centered, the outside portion having previously been machined. The chuck is screwed onto the headstock of the lathe like any other chuck and its bore is of such a diameter that the bearings form a sliding fit.

After a bearing has been inserted in the chuck it is held and centered



Home-Made Self-Centering Chuck for Holding Motor Bearings

by merely screwing up the threaded outside ring with a spanner. The inside shell of the chuck is split in three places so all three jaws close in on the work together.

The old chuck replaced had two jaws instead of three and each side was brought together independently with bolts passing through lugs. It required considerable adjusting and several trials before the work could be centered. Elimination of this task permits finishing bearings in one-third the time formerly used.

The simple construction and cheapness of such a chuck will enable any master machanic to make one for himself. It is made from a hollow brass casting solid on one end. The end is bored and tapped to fit the headstock threads and is then attached as it normally would be used while the inside is bored to the correct diameter and the outside is machined and threaded. The slots are cut on a milling machine.

Trough and Drainboard for Cleaning Screens

RAILWAYS which use car screens as guards to prevent passengers putting arms and heads out of open windows find considerable difficulty in cleaning the screens. The ordinary brush method has proved quite unsatisfactory, and for thorough cleaning it is necessary to remove the screens from the car. The accompanying illustration shows a portable tank and drainboard used by the Grand Rapids (Mich.) Railway for the cleaning of its car screens.

A compartment at the lower front edge is made watertight and is filled with some cleaning fluid which will loosen the dirt readily. The width of this trough is sufficient so that four screens can be put in at once. This constitutes the equipment for one car.

The screens are allowed to soak in this compartment to loosen the dirt and then they are removed one at a time and placed on the drainboard which constitutes the back of this trough and is inclined toward the front edge. After a few minutes' draining they are placed in a washing tank, which is shown at the back in the accompanying illustration, where the screens are thoroughly rinsed.

The device is constructed in a very substantial manner and is mounted on four rollers so that it can be pushed to the side of the car from which the screens are being removed for cleaning. The equipment has been found very convenient and a time saver for this class of work.

Portable Trough and Drainboard Which Have Been Found Effective in Grand Rapids for Cleaning Car Screens

Reconstructing Cars in Berlin

By the Use of a Special Truck Framing the Entire Car Body, Together with Long Platforms, Is Supported by the Truck Construction

BY E. KINDLER
Chief Engineer The Berliner Strassenbahn

THE decaying of the wooden structure of electric cars operated by the Berlin Railways has caused considerable trouble and has necessitated a thorough overhauling of the car body every two or three years. The joints between the wooden and steel girders become loose and allow water to enter, which causes rusting of the steel and rotting of the wood to such an extent that the entire car body becomes rickety. In an attempt to remedy this condition, the single-truck cars which are now being rebuilt have a truck frame extending the full length of the car body which supports the entire superstructure. For supporting the platform four 4¾-in. channels are attached to the truck framing. This construction gives a lighter weight car as well as a stronger one. The platform girders can be readily replaced, which is of great importance as collisions are quite frequent in Berlin. To protect the windows, roofing and vestibule sheathing, a steel reinforced wood bumper is provided at either end of the car. This takes the place of a heavy all-steel buffer previously used.

The flat, through-going supporting surface provided in the truck construction has a further advantage on this system, which uses many different types of cars, as car bodies of varying length can be placed upon the same truck. In reconstructing the cars a judicious shaping of the vestibule produces cars of uniform length and the passenger capacity can also be standardized.

The spring construction consists of four flat leaf springs resting directly on the journal boxes. Each of these is 68 in. long and 4 in. wide, and is built up of eight leaves. In order to give flexibility the ends slide in slots. The wheelbase of the reconstructed cars has been increased considerably, the dimensions being 9 ft. 2¼ in. now as compared with 5 ft. 9 in. previously. The frame is constructed of ⅝ in. steel plates riveted together, the openings having their edges reinforced by angle irons. Gusset plates are used at all corners.

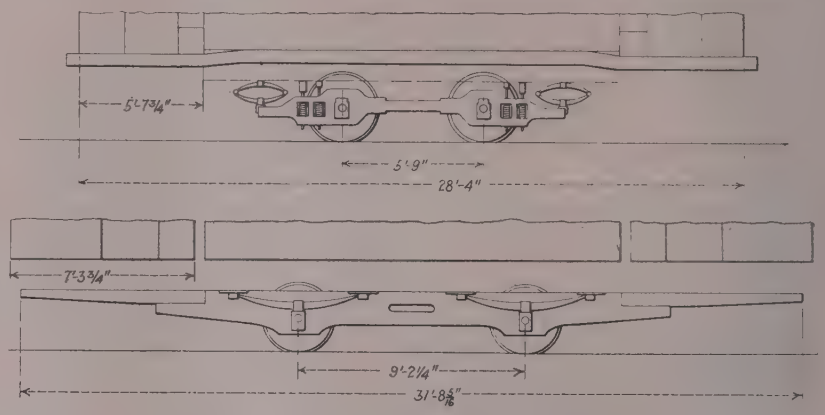
In the remodeling, the car bodies inside the bulkheads are not changed materially. In order to do away with the use of large sizes of glass, the side windows are divided into a number of panels. Glass ⅜ in. thick is used. The platforms are lengthened from 5 ft. 7¾ in. to 7 ft. 3¾ in.

The vestibule ends are provided with the usual sliding windows to permit throwing of switches by the motormen by opening this window. Outer doors are 28 in. wide and are of the Dresden type, which consist of a folding upper part with an inserted board at the bottom. This board insert has to be changed from one door to the other at the end of the line, but has advantages in space and in easy adaptation to weather conditions. A new German patent type of coupling is used. This has a special spring arrangement which insures smooth operation when two cars are coupled together.

Hand brakes are of the lazy-tongue type, which insure that the brakeshoes will fit to the wheels re-

COMPARISON OF OLD AND NEW CARS

	Old	New
Weight of car, tons	10	9.1
Seating capacity	20	20
Standing capacity in car body	2	2
Standing capacity in vestibules	14	24
Total passenger capacity	36	46
Over-all length	28 ft. 4 in.	31 ft. 8 5/16 in.
Wheelbase	5 ft. 9 in.	9 ft. 2¼ in.
Length of vestibule	5 ft. 7¾ in.	7 ft. 3¾ in.
Wheel pressure (full), lb.	7,000	6,900
Weight of car per passenger, lb.	550	400



Comparison of Truck Construction of Old and New Cars

New Constructed Car at the Left, Old Car at the Right

gardless of the load on the car. This type also prevents any grinding of the shoes upon the wheels and consequent uneven wear. The shaft of the hand-brake spindle carries a spiral groove casting to take up the chain.

Some changes were made in the electrical equipment, which was of obsolete type. The motors, which are GE-52, have been retained. Through this construction the rolling stock has been improved to a considerable extent, and expensive investments in new equipment and enlargement of shops have not been necessary. An accompanying table gives a comparison of the old and new cars.

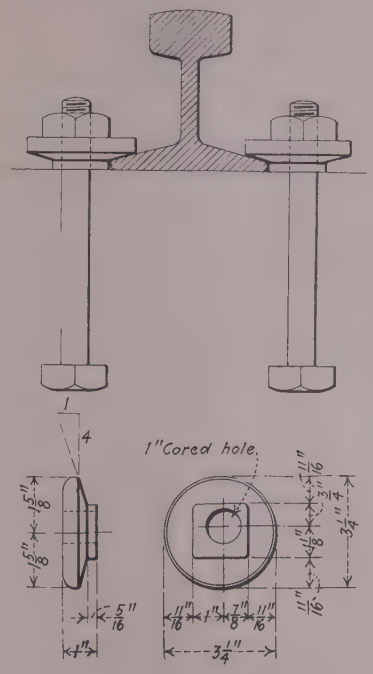
Inside Rigging Eliminates Brake Troubles

DURING the past few years the Lake Shore Electric Railway, Sandusky, Ohio, has changed over the brake rigging on about forty trucks from outside to inside hung. A number of faults and undesirable features in the old construction were overcome by the conversion. The outside-hung brakes caused a lot of chattering and were difficult to maintain in adjustment. There was also trouble from the breaking of the beam pull rods, and the absence of transoms in the truck construction allowed an excessive stress on the bolsters with the result that they were pulled out of shape. As one consequence of this, abnormal wear of the wearing plates and center bearing resulted.

These difficulties were all remedied by having steel transoms cast from which to suspend the inside brake rigging. The addition of these permitted the circle bars to be moved closer to the bolster centers so the turning of the truck has a decreased effect on the brake adjustment and minimizes the danger of tearing the rigging to pieces when the car splits a switch.

Eccentric Grip Washer

OCCASIONS sometimes occur when it is desirable to provide permanent fastenings for different widths of equipment. An example of this is the use of different rail sections on a concrete structure where the bolts used for fastening are set in the concrete. Where the bolts are set to accommodate a certain size rail, difficulty is experienced if renewal is necessary with rails of different sections. For these bolts have been set for a particular width of rail base, and usually will not fit another width.



Details of Eccentric Grip Washer

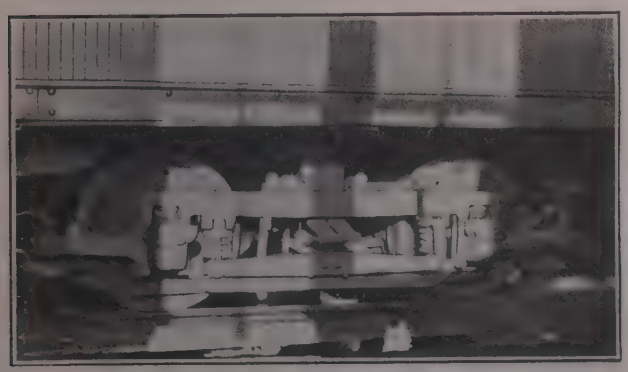
The accompanying illustration shows a type of grip washer which is used by the Canadian Pacific Railroad to hold down a section of rail with steel supports, where a variation in bolt holes could not be readily taken care of. The bolts for fastening were set with sufficient space between them so that they would accommodate the largest rail base to be used, and variations from this were secured by the use of the eccentric washer.

This washer consists of two parts, an upper circular disk with a conical base made to fit the fishing angle of the rail, and a lower part which consists of a square boss made to fit against the edge of the rail base. The square portion was not made concentric with the bolt hole, but was offset in two directions so that no two sides of the square portion are at the same distance from the center of the hole. With the dimensions selected, the distance from the bolt hole to the square side was made to vary by intervals of $\frac{1}{8}$ in., from a minimum of $\frac{3}{4}$ in. to a maximum of $1\frac{1}{8}$ in. This would thus provide for a total rail base variation of $\frac{3}{4}$ in. without change in the fastening bolt.

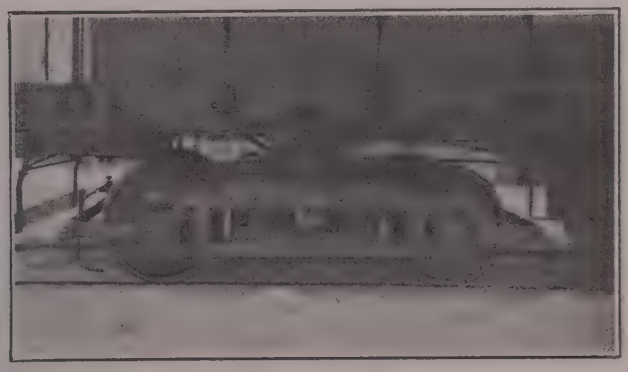
Getting a Few Years More Life Out of Old Track

NEARLY two years ago the railway company in Mason City, Iowa, installed some seventy of the joint boosters made by the Dayton Mechanical Tie Company. In spite of the fact that they were placed in the winter time by a force that was entirely unfamiliar with their use, the railway company reports that they have proved "very satisfactory indeed." The joints involved an expenditure of about 10 per cent of the reconstruction cost for the stretch of track in which the joints were used, and they give promise of securing several years further use of the track that the company is satisfied could not have been repaired in any other way.

The track in which these boosters were laid consists of 30-ft. lengths of 60-lb. low T-rails laid on cedar ties in solid concrete with a concrete



Original Truck Designed for Outside-Hung Brakes



Remodeled Truck with Transoms and Inside Brakes

pavement. The concrete below the ties was inadequate as to depth, but the surface concrete was excellent. The bolted joints had loosened, and the rail had battered, cupped and become surface bent. With the concrete cut out around the joints, the joint plates were cut off and the boosters inserted in the concrete. The joint angles were tightened and in some cases renewed and rewelded to the rail and to the base plate of the booster, and the nuts on the joint bolts spot welded. Some of the surface bends were taken out by the aid of a vertical bending device.

New Equipment Available

Variable Speed Transmission

THE accompanying illustration shows a variable speed transmission device applied to a drill press. This equipment is being placed on the market by the Driscoll Transmission Corporation, New York, N. Y. It replaces the usual method of cone pulleys and belts to provide different speeds. Through the use of this device the speed may be varied at will to that desired within the capacity of the machine by turning the control wheel. The machine is reversible and entirely inclosed to keep out dust and dirt.

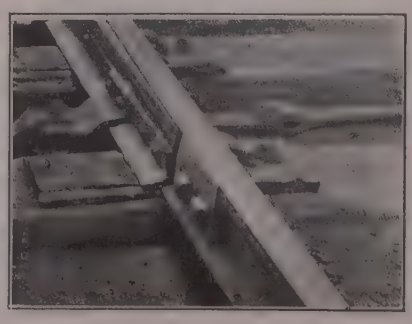
Variable Speed Transmission for Drill Press

Device for Lowering Welding Voltage

THE Electric Arc Cutting & Welding Company, Newark, N. J., has developed an adjunct for direct current arc welding. It consists of a magnetic switch together with a potentiometer for lowering the direct-current voltage to that desirable for arc welding. An additional feature consists of provision for adjusting the voltage at the arc as desired. This can be from 20 to 25 volts for metallic arc, or 40 to 50 volts for carbon arc. This does away with the ugly flare and a deep crater resulting from high-voltage direct-current welding. The magnetic switch remains out until the electrode is touched to the work. The closing of the circuit then brings the switch in, which holds the voltage at the desired low value. Should this value be exceeded, the switch automatically opens the circuit.

Railway Switch Point Protector

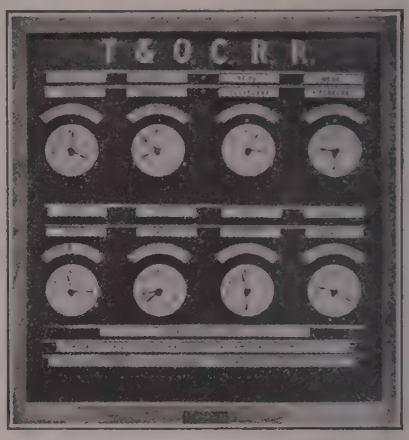
AN ACCOMPANYING illustration shows the Mack railway switch point protector which is being marketed by J. R. Fleming & Son Company, Inc., Scranton, Pa. The protector consists of a guard plate made of manganese steel and installed about 2 in. ahead of the switch point. The plate is shaped to conform with the head of the rail. Four bolt holes are formed in it to receive the fastening bolts and the heads of the bolts rest in a channel plate made to conform to the space between the flange web and the head of the rail. The object of the protector is to reduce the wear on the end of the switch point, to reduce the jar of impact on the switch rails and to avoid possibilities of derailment due to a loose switch point or the switch not shutting tight on account of an accumulation of snow or ice.



Railway Switch Point Protector

Board for Announcing Car Departures

A NEW TYPE of board for announcing the departure of electric railway trains or cars is being introduced by the Leu Perpetual Time Table Advertising Company, Chicago, Ill. It consists of a series of clock dials mounted on a base in a frame and covered with a glass door. The individual clock dials serve to indicate the time of departure or arrival of trains from a given point or destination. This type of board is intended to replace the blackboard and chalk system used for indicating the arrival and departure of cars.



Board for Announcing Arrival and Departure of Cars

Protection of Feeder Sections on Railway Lines

A NEW automatic feeder sectionalizing contactor, that automatically cuts out of service feeder sections on which short circuits or overloads occur and returns them into service again only when the trouble has been cleared, has recently been placed on the market by the Westinghouse Electric & Manufacturing Company. The contactor opens on overloads and recloses only when the potential difference between the feeder sections is sufficiently small to limit the flow of current on reclosure to less than the overload setting on a relay.

An overload relay, a main contactor, a holding relay, a snap switch, fuses, a resistor and terminals, constitute the equipment. This apparatus is assembled on a slate panel and mounted in an asbestos-lined wooden box for outdoor service.

The main contactor is of the clapper type, with a blowout coil and an arc chute. The overload and holding

relays are similar to each other (except for the coils). Both relays are automatically reset, the moving core dropping back by gravity and spring pressure when the operating coil is de-energized.

The overload relay has an operating range of from one to two, so that the relay can be set for any desired load within wide limits. The holding relay can be arranged to release the main contactor on a difference of potential between feeder sections of from approximately 30 volts to 100 volts or even higher.

Change-Making Machine and Fare Box

THE accompanying illustration shows a change-making register designed by the Springfield Change Making Register Company, Springfield, Mass. This device is a combination of a change-making machine and the Springfield fare box designed by the same company, making a complete fare-collecting equipment which provides a record of each fare collection at the same time change is given to the passenger.

The fare box section shown at the right is of the locked type and includes all the improved features of the Springfield fare box. The receiving hopper, a casting of aluminum alloy, has a large, free passage admitting tickets as well as money, and is carefully baffled so that money cannot be drawn back through it by any mechanical means.

In the receiving chamber at one side of the inspection plate is a telltale ball, mounted on a vertical staff in such a way that if the box is overturned the ball rises to the top of the staff and is held there by a latch underneath the plate, which cannot be released until the box is returned to the office and opened by an inspector, who may, of course, make an investigation of the overturning of the box.

The money drawer, a single piece aluminum alloy casting, carried in an opening at the lower part of the casing, is locked into the casing by a Yale lock and can be removed only by an authorized person who is provided with a key. There is, in addition, an automatic locking device that retains the drawer in the casing, independently of the Yale lock, until the inspection plate has been tripped and held down, discharging all coins on the plate into the drawer before it can be removed.

The push button shown beside the receiving hopper is connected to a signal bell and to a visible register inside the glass receiving chamber by means of which the car operator registers the number of passengers entering the car. This eliminates the overhead register with its connections and fittings.

The change-making section, shown at the left, consists of two batteries

Combination Change-Making Machine and Fare Box

of vertical tubes, five tubes in a row, placed one row behind the other, inclosed in a plate glass casing. Five operating slides below them are arranged so that each slide controls a tube in the front row and its corresponding tube in the back row. A handle for each slide projects through the front of the casing. A casing which is a single casting of aluminum alloy supports the tubes and incloses all the working parts, also the money drawer for the fare box section and a separate drawer for receiving the record checks referred to further along. At the side of the fare box is a change cup into which the passenger's change is delivered through a spout.

The front set of tubes is loaded with coins so arranged in the tubes as to provide the correct change for the fare paid out of the coin tendered by the passenger when the proper operating slide is moved, as one out of a dime, one out of a quarter, two out of a quarter, the change being delivered by the movement of the operating slide to the change cup at the side of the fare box.

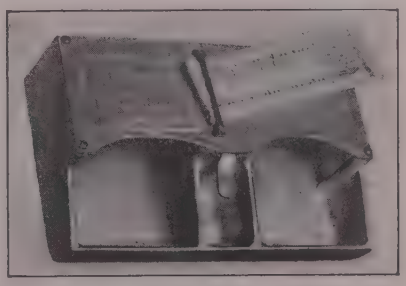
The rear set of tubes is loaded with metal checks which make the record of the fare paid when the passenger requires change. When the slide handle below a change tube is pulled to make change, checks are dropped from the corresponding rear tube into a separate locked drawer in the lower casing; one check if one fare is paid, two checks for two fares, and so on. At the same time the change is deposited in the change cup. The change cannot be deposited in the change cup without at the same time dropping the recording checks into the check drawer, and an automatic lock is provided in each check tube, so arranged that if the checks in any tube are all used, or so nearly used that there are not enough left to make a complete record of the number of fares being paid, the operating slide is locked and no more change can be issued from the corresponding money tube.

The money tubes are open at the top so that they may be replenished as needed by the conductor, who provides himself with change for that purpose. There is a separate cover with lock for these tubes and a lock in the base controlling the operating slides so that the conductor can lock the machine if he is obliged to leave the car. Provision is made in the operating slides for adjustment to meet changes in the rate of fare. The money and check tubes are perforated so that the amount of money or checks in each tube is visible.

The complete box is about 24 in. high, 16 in. wide, 8 in. from front to back and weighs 40 lb.

Transfer Abuse Prevented by New Issuing Device

UNTIL recently the Tri-City Railway operating in Moline, Rock Island and Davenport lost considerable revenue by the abuse of the transfer privilege. Presenting of invalid transfers was practised most consistently and flagrantly on certain lines carrying factory workers. With the ordinary punched type of transfer, the time indicated was not easily visible and in case an old transfer was detected, for the conductor to prove that he had received it from a certain passenger was practically impossible, especially in rush hours. Transfers punched "a.m."



Aluminum Box for Use with Tear Transfer System

were being used at the indicated hour in the afternoon.

To correct this misuse a new type of transfer was developed which is torn off at a length according to the hour. The car operator can distinguish at a glance between a.m. and p.m. transfers because of the marked difference in length. Various colors are used for the different directions and lines for which transfers are issued. For holding and issuing the transfers a wooden box having several compartments was constructed and attached to the air pipes below the brake valve. An improved box has recently been adopted that is made by Nic Le Grand, Inc., Rock Island, Ill. It is made of cast aluminum and designed with a cleat like a fare box so that it is removable. The pad of transfers is inserted under a U-shaped bar which holds a constant pressure on the pad so that after the pad has been adjusted at the end of each trip a transfer can be torn off with one hand. The compartments of the box are for holding tickets and extra transfer pads.

Differently colored transfers are used for each line of a system, or where a line runs in two directions from the traffic center, and where lines parallel each other, which affords an opportunity for the passenger to double back on a transfer, separate colors are used for each end of the line. The date is printed in large figures and provision is made for punching the month at the extreme edge. The hours in fractions are so arranged on the transfer that the later in the day when torn off the longer will be the transfer. A system of keeping transfer records and issuing transfers to the operator so as to eliminate waste is a part of the Tear transfer system.

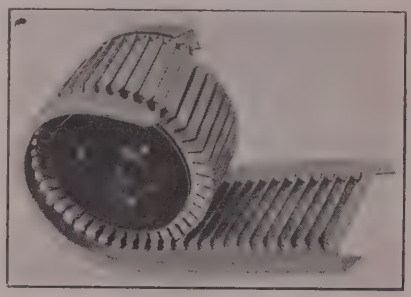
E. T. Anderson, superintendent of transportation, claims that the box is almost indispensable with one-man operation. All the equipment in Davenport and Rock Island was changed over to complete one-man operation about ten months ago.

Portable Lamp Cord for Rough Usage

THE Okonite Company, Passaic, N. J., is placing a new flexible unbraided portable cord on the market. It has the trade name of "Okocord" and has double tinned conductors scientifically stranded, insulated with Okonite, braided with dry white and black cotton, and inclosed in a jacket of smooth, tough, indestructible 60 per cent Para rubber. This new product is designed particularly for use in rough, wet or oily places, such as is encountered in electric railway shops.

New Type Motor for Shop Use

IN A NEW a.c. motor recently marketed by the Louis Allis Company of Milwaukee, Wis., a somewhat novel construction is used for the rotor windings. The motor is designated as the L-A type H.D. and the entire winding of the rotor consists of an integral sheet of copper punched and formed by a special mechanical process. This one-piece winding is machine-wrapped around the rotor core, the copper bars being expanded into the core slots by swaging, as indicated in the accompanying illustration. The multiplicity of joints contained in the ordinary type rotor is thus done away with and the single joint necessary which extends through the two end rings is silver welded, after which the metal at both connections is processed by means of a contracting operation that hardens the copper at the point where the heat, applied during the welding, has softened it.



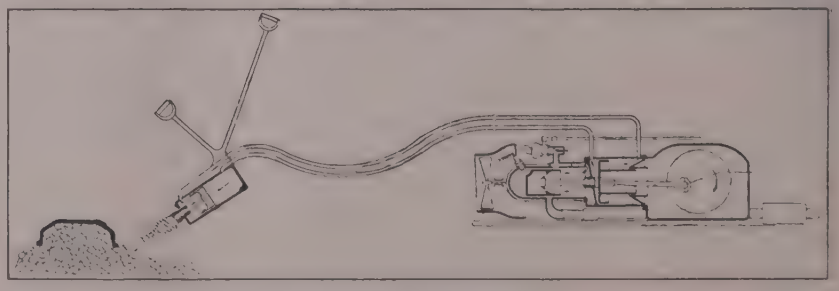
Rotor Winding Punched from a Single Sheet of Copper

The rotor core is a self-contained unit and may be pressed on and off the shaft readily. Particular attention has been given to the electrical characteristics of the new motors and they are guaranteed to carry their full rated load continuously with a temperature rise not exceeding 40 deg. C., and after their ultimate temperature has been reached to carry 25 per cent overload for two hours, with a temperature rise not exceeding 55 deg. C. The motors are made in standard industrial sizes, voltages and frequency.

Rapid Blow Tamper

A NEW TYPE machine for forcing crushed rock under ties is being built by the Krupp Works in Germany and was described in a recent issue of the *Krupp Monthly*. There are two air connections from the compressor to the tamper. One of these is on the exhaust side of the tamper piston, the other on the driving side. The movement of the tamper piston is actuated by intermittent air pressures supplied by a two-cylinder forced air-cooled benzol motor. Due to the differential action of this two-step air pump, the return of the tamper piston is much slower than its outward stroke. As constructed, about 1,400 impacts per minute are produced as compared to thirty by hand operation. This high speed results in a practically constant forward travel of the crushed rock.

In order to relieve the operator from undue strain, the tamper is provided with two handles located at an angle of 90 deg. to each other. The air compressor equipment together with the fuel reservoir, tools and spare parts are mounted upon skids to facilitate transportation.



New Tamper and Compressor

Figures given regarding the saving which results from the use of this machine indicate that approximately 40 per cent is saved in the actual time and labor, but as a tie with rocks forced under it by the machine will require considerably less attention than one tamped by hand, the real saving is about 60 per cent.

Association News & Discussions

Results Obtained with High-Speed, Light-Weight Interurban Cars*

Some Operating Data Obtained with These Cars on the Western Ohio Railway, Which Has 112 Miles of Track—Improved Service and Increased Revenue Result—Accident Hazard Reduced

By E. B. Gunn
Superintendent of Transportation & Equipment
Western Ohio Railway, Lima, Ohio

IN JANUARY, 1918, abnormal operating conditions forced the Western Ohio Railway temporarily to change its interurban service from a one-hour schedule to a two-hour schedule. Competition from the automobile and motor truck made it impossible to go back to the hourly schedule with the heavy cars then in use.

Realizing that two-hour service was not adequate for our territory, we began, in the fall of 1920, to investigate the light-weight interurban car proposition. In the neighborhood of Cincinnati we found two properties that had been operating cars weighing 24,000 lb. and 25,000 lb., with an energy consumption of about 1¼ kw.-hr. per car-mile as against the 2.8 kw.-hr. used by our 66,000-lb. car. In April, 1921, we placed an order for eight cars to be 45 ft. long over all, 34 ft. 3 in. over corner posts, 8 ft. 8½ in. wide over all, 10 ft. 9 in. from rail over trolley board and 32 in. from rail to floor with a seating capacity of forty-two plus seats for six passengers in the baggage compartment. These cars were to weigh not more than 33,000 lb. complete, equipped with four 35-hp. motors. It was specified that the cars must make the same or better running time from Piqua to Findlay (80 miles) than we had been making with our former equipment. This time was three hours and twenty minutes.

New Spring Suspension Successful

The cars were delivered early in September. They bettered our running time by five minutes, but did not ride comfortably at speeds greater than 30 to 35 m.p.h. The trouble was with the spring suspension. Below this speed the link used for suspending the elliptic spring appeared to take care of the side motion, but above this speed there was a serious jerky side motion with operation over an average track. The builders then devised a new set of spring links for suspending the elliptic spring, the head of each link being fastened rigidly to the truck frame. The cars now ride perfectly at any speed.

We are now operating between Piqua and Lima, 47 miles, in one hour and fifty-four minutes; from Lima to Findlay (on which the two-hour schedule is still operating) we make the 32 miles in one hour and fifteen minutes and a six-minute layover is allowed at Wapakoneta for loading baggage, etc., there being at this point a connection with cars from St. Marys and Colina.

Quick Acceleration Permits Making of Fast Schedule

We are making our schedule more easily than with our former equipment. At Findlay we make connections with lines from the north, and often hold trains ten or fifteen minutes. We find that they can still get into Wapakoneta on time, 47 miles from Findlay. The cars make speeds as high as 53 m.p.h. in some cases. We make our schedule on account of the quick acceleration, due to the lightness of the cars and to having full voltage at the motors. These cars require but 175 amp. to start them. Since we have been using these cars, we can shut down one rotary converter in each of our substations during the day.

As to operating costs, as compared with the heavy car, the energy consumption of the new car for November and December last averaged 1.45 kw.-hr. per car-mile in November to 1.5 kw.-hr. maximum in December, due to heavier riding, snowstorms, etc. The cars make 76,000 miles per month, and average 309 miles per day.

The following table shows the comparative lubricating and brakeshoe costs:

LUBRICATION COSTS

November, 1922,	55 lb. tulc, at 7¾ cents	$4.26 or 5.65	cents per thousand car-miles
December, 1922,	51 lb. tulc,	3.95 or 5.42	cents per thousand car-miles
November, 1921,	165 lb. tulc,	12.78 or 19.3	cents per thousand car-miles
December, 1921,	155 lb. tulc,	12.01 or 20.6	cents per thousand car-miles

BRAKESHOE COSTS

November, 1922,	36 at 57 cents,	$20.52 or 27.2	cents per thousand car-miles
December, 1922,	51 at 57 cents,	29.07 or 38.8	cents per thousand car-miles
November, 1921,	95 at $1.10	104.50 or $1.57	per thousand car-miles
December, 1921,	125 at $1.10	137.50 or $2.02	per thousand car-miles

The 26-in. wheels that we use under these cars cost $22.50 each as against the cost of $41.66 each for the 36-in. wheels formerly used. It appears that we shall get two-thirds of the mileage that we did from the old wheels, as our cars have made approximately 35,000 miles and the flanges are still in good condition. They will probably make 45,000 to 50,000 miles more before requiring welding and turning.

The cost of trolley wheels will probably be 40 per cent less than with the old cars. We are having no trouble with the wheels spitting or burning, because the current drawn by the cars is small.

Track maintenance should be reduced materially, even though we still operate heavy freight service. This freight service is, however, low speed, so that once the track is put into condition it will not require the attention that it would with the high-speed passenger service.

Maintenance Costs Reduced

We have reduced the cost of labor in the shops by the wages of seven men, and if it were not for the maintenance of the equipment we would need three or four men less. Of course the maintenance of the new cars costs nothing as yet, as they require only inspection and lubrication. We have been able in November and December to save about $2,100 per month at the shops, covering labor and material.

As to the effect of collisions on these cars, we have had about as many collisions with automobiles with the new cars as with the old ones, but none of these was serious, because the cars could be stopped quickly. As the cars are low, we find a tendency to push a vehicle ahead of the car rather than to tip it over. The occupants of a vehicle with which a collision occurs are not liable to be injured seriously. As far as damage to the bodies of the new cars is concerned, they have stood up as well as the old equipment. A collision usually means only new glass in the front and straightening up of the corner posts and steel front of the car. This work can be done cheaply and the car is soon back in commission.

Since the light-weight cars have been in operation our receipts are increasing. For the last three months of 1922 they have been ahead of 1921, whereas for the first nine months of the year they were behind practically every day. We believe that this equipment is going to be the salvation of our property, as it will enable us to compete with other means of conveyance and enable us to provide a service that will appeal to the traveling public.

*Abstract of paper read at meeting of Engineering Council, Central Electric Railway Association, Louisville, Ky., Jan. 18, 1923.

Governor Smith's Recommendations Criticised*

Investment Bankers Consider the Legislation Recommended Will Impair Utility Credit and Retard Expansion—Municipal Authorities Too Interested to Act Judicially

By Henry R. Hayes
Chairman Committee on Public Utility Securities,
Investment Bankers' Association

IN HIS message to the Legislature of New York Governor Smith on Jan. 3 recommended legislation with respect to public utilities which requires the immediate and serious attention of the association.

The principal recommendations are:

1. To abolish the present Public Service Commission and to substitute therefor three commissioners (to be appointed by the Governor) to be charged only with authority to regulate "such utilities as will not be regulated by cities, either because they operate outside the corporate limits of a city or because the city may, by proper resolutions, request the State to do it."
2. "That in the preparation of the legislation to abolish the present Public Service Commission, the power heretofore held by the cities over the terms of their franchises be returned to them."
3. "That the cities themselves should be permitted to purchase, build, own and operate 'public utilities' when a municipality determines this to be in its best interests."
4. "That the Transit Commission in the city of New York be abolished and all its powers with regard to the laying out of routes and supervision of construction be transferred to the Board of Estimate and Apportionment, to be exercised by this body through any agency which it may select," and that "its regulatory powers should be restored to the Public Service Commission Act, which will contain the provision that a city may be the agent of the State for carrying out these powers unless it should by proper resolution, request the State to relieve it of the duty."

There are two main desires expressed in these recommendations:

(a) The practical abolishment of statewide regulation of public utilities and the substitution therefor of municipal regulation, and

(b) Municipal ownership of utilities where cities may so elect.

Prior to the delivery of the Governor's message the advanced news reports in the public press indicated that a very radical change in State regulation would be recommended, and your president endeavored, but without success, to have an interview with Governor Smith in order to apprise him of the views of this association. It was felt that the proposal alone of a very radical change in the regulation of public utilities in the State of New York would be alarming to investors.

In a discussion of these matters we must bear in mind that the situation with respect to the rapid transit and surface lines within the City of New York is special unto itself on account of the nature of the contractual relations existing with the city. Therefore, this phase of the problem will not be presented at this time by your committee.

Owing to the fact that credit of public utility companies and therefore confidence in the securities thereof have been created especially in States where there has been conservative and judicial regulation as well as freedom from local or political influences, your committee now feels concern over that part of the recommendation which has to do with the regulation of utilities other than the transportation systems in the city of New York.

Good Faith of State Is Involved

For a great many years the policy of statewide regulation of public utilities has been the established policy of the State of New York. In fact, New York was one of the first states to recognize this principle. It has been followed, as we know, very generally by other states throughout the country advantageously in the public interests. Furthermore, recognizing the great advantages of judicial regulation, protection of the public interests and freedom from political influences, especially up State, investors have freely placed funds in these utilities with all the risks attendant to these investments. When viewed in this light, the good faith and moral credit of the State is involved. Investors would not have continued so freely to support the much needed expansion of utility services by investment in their securities had they expected these industries to be again subjected to the danger of political control and local regulation.

This association, through its members, has in a very large measure been responsible for the providing of these investment funds. Surely, therefore, it is incumbent upon us to study the situation seriously with a view to giving constructive suggestions to the end that conditions which make consideration of such legislation possible may be remedied. In this way only can we progress and not retrace our steps a long way backward.

It seems pertinent, therefore, for us to inquire just what exists in this New York State situation which makes it possible to disregard the experiences of that and other states in this country.

Voters Don't Understand Situation

Preeminently, there stands out the fact that the voters of this state cannot understand or appreciate the real interest which they have in seeing to it that companies be honestly financed, managed and regulated and that only in this way can they, the voters, be furnished with adequate service at reasonable costs. Furthermore, it cannot be definitely recognized by the public as a whole that with proper regulation and the advantages which that supervision brings in the nature of protection to investment values and the creation of fair capitalization, public utilities are prohibited from making undue profits. Indeed, under sane regulation their profits are very limited when compared with the privately owned industrial concerns. Investors are quite willing to accept this restriction, but they must be afforded stability of interest and dividend returns, safety of principal and freedom from attack incident to local or political controversies.

The chief purposes of state regulation of public utilities are:

(a) To plan economically a development of service without regard to the corporate limits of any one locality, and to determine the extent and character of such service so that it shall meet all demands in the territory served and respond promptly to the increasing requirements of growing territory.

(b) To establish the fair investment values created for the service, and to fix the interest rates of return on such values sufficient to attract the ready flow of money into the business as needed.

The individual consumer or user of utility service concerns himself chiefly with the price of the service. How cheaply can he get it? He takes little or no interest today in the protection of the investor's money which provides that service. As a matter of fact any customer of public service, if he understands the problem, must admit that he is more interested in good service than in cheap service, and he can be shown that although a poor and underfinanced company can give him cheap service, only a prosperous company can give him the best service.

Municipality Too Interested to Act Judicially

Were a municipality to undertake the regulation of utilities within its corporate limits with the same broad powers now vested in the State Public Service Commission, the agency created by the city for this purpose would, among other duties, be required to act in a judicial capacity in determining the fair investment values upon which to base a rate of return and the charges for service, to produce this required return. As representing its citizens, the City has a partisan interest in the determination of such important matters. We thus see the city in a double rôle—acting as a special pleader for one side of a controversy on the one hand, and acting on the other hand as judge to decide the merits of a case as presented by both parties. Well-managed private business is not conducted under such procedure and there is no reason why public business should tolerate it.

The above are merely some of the important points needing emphasis in a broad plan of education in the economics of the public utility business which must be conducted in the State of New York to make clear to the voters the advantages of State wide regulation of public utilities. Much of this must necessarily be carried on by the managements of the privately owned prop-

*Abstract of interim report presented to the board of governors of Investment Bankers' Association of America by its committee on public service securities and adopted by the board on Jan. 12, 1923.

erties in a manner to create confidence.

With reference to Governor Smith's recommendation that municipalities be given the right to purchase, build, own and operate public utilities, it is certainly the opinion of this association, supported by the indisputable results of public operation, that except in a very few instances municipally owned properties have not been successfully operated. On the other hand, they have almost invariably proved unsatisfactory to the tax payer and to the public served. The most recent experiment, namely, that by the city of Detroit, is already furnishing serious and difficult problems.

It may not be wise or expedient now to deny that a community ought to have the right to own and operate properties if it so elects. In view of the consistently poor record of federal, state and municipal operation of utilities, it is certainly our duty to challenge the wisdom of municipal ownership and operation. In any case where such legislation is proposed, it is essential to see that provision be made for the purchase of existing properties at fair values in order to avoid the evils attendant on competitive plants long recognized as distinctly undesirable from all points of view. To those who desire to study the results of public operation we commend the findings of the special committee of the Merchants' Association of New York in its report dated Jan. 23, 1919. The study made of government ownership and operation of public utilities by that committee was very comprehensive and we quote the following:

> Except under war conditions the sole plea that can be advanced to justify the operation by governments of public utilities is that governments can provide better service at less cost to the public than can private operators; that is to say, the assumption that government operation is more efficient and less costly than private operation.
>
> We do not believe that this contention can be sustained. On the contrary, we contend that the operations of governments in the economic field, and particularly under American conditions, are generally characterized by inefficient management and excessive cost; so that under government operation the public would get poorer service and pay more for it than under private operation suitably regulated by public authority.
>
> The cause of inefficient management and excessive cost when governments undertake economic activities is simple. All the activities of any government are necessarily carried on by political machinery and that machinery is wholly unsuited to the economic field.
>
> The fields of politics and economics are dissimilar and separate. The field of politics (meaning thereby the art of government) is mainly the regulation of conduct and the protection of rights. The field of economics is the production and utilization of material things. The principles, the methods and the machinery of political administration are wholly different from those of economic activities and not adapted nor adaptable to the latter. The differences are fundamental and cannot be reconciled. When, therefore, the machinery of political action is applied to economic undertakings, it works badly and makes impossible the perfect co-ordination which alone, in the economic field, produce efficiency and economy of operation. A brief comparison of the machinery of business with that of political action, will show clearly why political machinery does not and cannot work effectively in the field of economics.

Briefly, to summarize the New York situation, your committee unanimously feels:

1. That the legislation recommended by Governor Smith will create a lack of confidence on the part of large and small investors within and without the State, including insurance companies and savings banks, thereby seriously impairing the credit of utility companies and, accordingly,

2. That until such time as the policy of statewide regulation is reaffirmed definitely, the expansion of utility service will be greatly retarded.

Your committee believes, therefore, that this association should take an active stand against any legislation intended to carry out the special features of Governor Smith's recommendation discussed in this report, and recommends that the Board of Governors at this time give public expression to their disapproval of the legislation which is proposed.

A Foreman's Relation to His Men and His Company*

An Analysis of the Qualifications Needed in a Successful Foreman, Together with Some Observations on the Advantages of Employment with an Electric Railway Company

By F. G. Buffe
General Manager for the Receivers,
Kansas City (Mo.) Railways

ELECTRIC railway work is not easy in any department; but it has compensations. It is not monotonous; it has a compelling interest, and it gives an opportunity for initiative, tact and cheerfulness. There are no lay-offs, no shut-downs, no idle seasons, no strikes, no interruptions.

In the electric railway organization the link which connects the employee and production, on the one side, with direction, management and planning on the other, is the foreman, or assistant superintendent, or supervisor, or whatever he may be called. He forms the spirit of direct contact between employee and management. A foreman is chosen because he possesses certain qualifications, among which are: absolute knowledge of every job under his direction; ability not only to handle men but to lead them; willingness to accept responsibility and the obligations that go with responsibility; qualifications for promotion to higher position, and ambition for self-improvement.

A foreman must have executive ability and a thorough trade education. In addition, he must be able to judge men, have a deep sympathy with their troubles and be able to inspire their confidence. Energy, perseverance, thoroughness and self-control are also necessary. And the foreman must have a true realization of the value and dignity of his job, its responsibilities and obligations.

Job knowledge is so apparent a qualification as almost not to need special mention. A foreman is at the same time an instructor. He must be a competent and skilled workman, an expert operator, an accurate judge of work and machines, a judge of good work and an equally good critic of poor work. He must be able so to direct his men that the things they do may be done in accordance with the best methods.

The foreman must keep in touch with developments in his work. Where faulty and time-losing or material-wasting methods are being used, he must be alert to correct them. He must not only be prompt to make suggestions himself, but should encourage the making of suggestions by others. He should study the proper method of introducing a new man to the job. He should lead in safety first work and keep a careful eye out for safe practices on the part of every man and machine under his direction.

The ability to handle men and to lead them is the first mark of difference between a workman and a foreman. The scientific management of men is a professional equal to that of the teacher. It demands a deep study of human nature under all conditions and above all calls for an every-minute application of the square deal.

Definition of Executive Ability

The ability properly to handle men is acquired, although some have more native genius for it than others. A good definition of it is this: The art of producing the greatest amount and best quality of work at the lowest cost and in the least time with the greatest amount of satisfaction to all concerned.

A good foreman is concerned not only with his company's interest but with that of the workers. This implies friendly help, constructive criticism, encouragement, proper supervision, a square deal in every act, just discipline, no favoritism and broad sympathy with, and a thorough understanding of human nature. A conscientious foreman should learn something of the home surroundings of his men, their troubles and ambitions. He should be ready with a helpful word, timely advice, or a bit of sympathy.

A foreman must be able and willing to accept responsibility and its obligations. When a worker is elevated from the ranks, he becomes a leader, charged with the duty of governing. He can no longer think with the mind of a workman; his viewpoint must change; he is a part of the management. Many men when given authority are unwilling or unable to quit the mental attitude of a worker and adopt that of the new position. In other words, they have not awakened to the dignity or value of the job.

A good foreman should possess or acquire those qualifications which will

*Abstract of a paper read before the Shop Foremen's Association of the Kansas City Railways, Dec. 13, 1922.

fit him for promotion. He should constantly strive to learn more of his job, and should study and develop his talent so as to be ready when the call comes. Opportunities for study and development are on every hand.

In conclusion emphasis should be laid on four qualities or characteristics which are essential to success. These are: Tact, sincerity, loyalty, and initiative. The foreman has been placed in a position of trust and responsibility. He is the channel through which orders are transmitted, and he is charged with the duty of getting the work out of his department in the quickest time at the least cost. To him has been deputized the part of management. The management's policy must be carried to the men through him. He is an indispensable link in the chain.

No Steam Railroad Exhibits This Year

FOLLOWING the announcement that there will be no convention during 1923 of mechanical division, V, American Railway Association, the executive committee of the Railway Supply Manufacturers' Association announces that its 1923 exhibits will be postponed. This decision was reached after a thorough understanding as to the wishes of the several divisions of the A.R.A. with which the R.S.M.A. has been associated. The R.S.M.A. executive committee understands that it is the plan of divisions V and VI, A.R.A., to hold strictly business meetings during 1923. The executive committee believes that this action will meet with the approval of the members.

American Association News

Equipment Committee Organizes for Active Season

THE committee on equipment of the Engineering Association met at the association headquarters in New York on Jan. 12 and inaugurated detail work for this year. Those present were F. H. Miller, Louisville, Ky., chairman; Daniel Durie, Connellsville, Pa., sponsor; Walter S. Adams, Philadelphia, Pa.; Louis J. Davis, Brooklyn, N. Y.; Charles Gordon, Chicago, Ill.; J. L. Gould, Wilmington, Del.; M. O'Brien, St. Louis, Mo.; E. D. Priest, Schenectady, N. Y.; P. V. C. See, Akron, Ohio; Karl A. Simmon, Pittsburgh, Pa.; C. W. Squier, New York, N. Y., and W. G. Stuck, Lexington, Ky.

The subjects assigned to the committee were discussed in detail and subcommittees were appointed to make investigations and collect data. The subcommittee appointed to study gearing is Mr. O'Brien, chairman, and Messrs. Davis, Gordon, Hazlewood, Hipple, Priest, Stuck and Taurman. This committee is to secure the co-operation of gear manufacturers in the study which will be made and their representatives will be invited to the next meeting of the sub-committee. A questionnaire will be sent to operating companies requesting desired information.

The sub-committee appointed to study various devices for trolley contact, together with the effect upon trolley wire, will comprise J. L. Gould, chairman, together with Messrs. Davis, Gordon, Hipple, Priest, Stuck and Taurman. This sub-committee will use a questionnaire in connection with its work.

As a sub-committee to review existing standards with the idea of possible revision and for presentation to the American Engineering Standards Committee, the following were appointed: C. W. Squier, chairman, and Messrs. Adams, Gordon, A. J. Miller and See. This subcommittee was directed to consider changes in the association specifications for rubber hose and to co-operate with the association's representative on the American Engineering Standards Committee dealing with this subject. The question of tolerances for the bore of gears was discussed and will be included in the committee's work for this year.

A new subject to receive consideration this year is that of spring supports for railway motors. From the discussion which took place and the various data which have already been collected, it appears that this subject will prove interesting and beneficial. P. V. C. See, chairman, and Messrs. Adams, Davis, Gould, Hipple, O'Brien and Priest will comprise the sub-committee to consider this subject.

The subject of dust guards for bearings was discussed, and it appears that no standards for these have been developed as yet. The equipment committee believed that such standards ought to be prepared, and a sub-committee was appointed to consider this subject, as follows: Charles Gordon, chairman, and Messrs. Adams, Davis and Gould.

Purchases and Stores

A MEETING of the Engineering Association committee on purchases and stores was held in New York on Jan. 16, with the following members in attendance: B. J. Yungbluth, chairman; W. S. Stackpole, vice-chairman; R. H. Dalgleish, sponsor; Jackson P. Dick, H. H. Lloyd, J. F. Fleming, W. C. Bell and W. H. Staub.

The committee having been assigned the subject of reviewing the 1921 report of the joint committee on stores accounting, the discussion of this report at the 1922 convention was first considered. The committee concluded that the report as originally submitted should be approved and that the material classification recommended therein should be adopted by the association.

A sub-committee was next appointed to prepare a detailed statement explaining the use of the classification code, for the benefit of those who may desire to put it into effect.

After recommendations made by Mr. Dick concerning the enlargement of the scope of activities of purchasing agents and store keepers in association work had been considered it was decided that the committee would make a formal request to the executive committee to arrange for a session of purchasing agents and store keepers at the next annual convention. The session, of course, will be entirely aside from presentation of the committee report at the regular engineering meeting. The committee expects to present with its request a comprehensive program of the special session and will conduct an active publicity campaign to make the meeting a success. Chairman Yungbluth then appointed Messrs. Dick and Lloyd as a sub-committee which will be in charge of the program for this special session.

Next, the report of the 1922 committee on purchases and stores was discussed. The importance of reaching a definite decision regarding the material classification and forms recommended therein was considered essential to the determination of proper inventory methods. It is expected that definite decisions in regard to these matters will be reached at the next meeting, which has been tentatively set for March 5.

Traffic Regulations

THE committee on traffic regulations of the T. & T. Association held a meeting in Chicago on Jan. 17. Previous reports of this subject were reviewed, and it was decided that each member of the committee should write a brief description of the traffic situation in his city, along the lines of the traffic survey of Baltimore, which appeared in the Jan. 13 issue of the ELECTRIC RAILWAY JOURNAL. These articles will be reviewed later on by the committee, and recommendations will be made based on the situation in these large cities. A questionnaire will be sent to a number of railway companies, to determine the situation as to anti-parking regulations and limitation of track use by vehicles. These companies will also be asked to tell about the progress of methods for improving the handling of traffic in congested centers, with particular reference to limitation of left-hand turns, segregation of vehicle traffic, semaphore control of traffic, location of passenger stops, one-way streets, etc. The report of the committee will show a number of photographs of congestion along street railway lines in various cities.

Those who attended the meeting were: H. B. Flowers of Baltimore, chairman; Frank P. Edinger of Chicago, Henry O. Butler of St. Louis, F. R. Cogswell of Pittsburgh, also J. V. Sullivan and John E. Wilkie of the Chicago Surface Lines.

It is likely that another meeting of the committee will be held about May 1.

The News of the Industry

Rapid Transit Body Complete

Transit Development to Be Planned for Detroit Based on 3,000,000 Population

The rapid transit commission for the city of Detroit has been completed by the naming of Andrew H. Green, president of the Charcoal Iron Company of America, as the fifth member of the commission. The other members are Sidney D. Waldon, chairman; Clarence W. Hubbell, former Detroit city engineer; Willard Pope, civil engineer, and H. W. Alden.

PROGRAM FOR RAPID TRANSIT

D. L. Turner, consulting engineer of the New York Transit Commission, has been retained as consultant by the Detroit commission and an estimate made of the commission's budget requirements with which to carry out the survey. The commission will make a survey of the city's rapid transit needs, supplementing the report of Parsons, Klapp, Brinckerhoff & Douglas, which was completed about four years ago.

The City Engineer's office, the Department of Public Works and the Department of Street Railways will all be asked to aid the rapid transit commission in working out a program for a rapid transit system.

Acting Mayor John C. Lodge has outlined a fourfold task for the commission, visualizing a population of 3,000,000 for the city of Detroit in 1950, within the 20-mile radius. The immediate drawing of a budget is advised by Mr. Lodge, for although the sum of $50,000 has been placed at the disposal of the committee by the Council for preliminary expenses, this money can only be drawn upon after the acceptance of a budget.

Four or more construction programs for rapid transit are to be drawn up by the commission and a sound financial plan evolved to be submitted to the electors for decision at the April election, 1924.

DUTIES OF COMMISSION OUTLINED

The essential duties of the commission are outlined as under the following four heads:

1. Study of the records of the city of Detroit and other large cities having similar rapid transit problems.
2. Consult with foremost authorities on urban rapid transit and related subjects.
3. Prepare building and financial plans.
4. Collect and preserve all such records, drawings and documents as may be of use, and readily turned over to the Department of Street Railways or other departments as may be designated by the Mayor.

The Detroit Board of Commerce has made a suggestion that a general manager be employed for the Department of Street Railways, which according to H. H. Emmons, president of the board, was prompted by the thought that a general manager ought to be appointed before the coming election to remove the Department of Street Railways from the plots and counter plots of politics. Mr. Emmons voiced the belief of the board that the question of management of the Department of Street Railways should be settled as a business matter immediately and not become an element of politics.

The fact was pointed out that since the resignation of former Mayor James Couzens, the street railway system has been in the hands of three very capable men whose interests necessarily are centered on their own individual business, and although every man in the present administration is doing the best that can be done under the circumstances, the commissioners are working under difficulties because authority is not centralized as it is in other city departments and in successful businesses.

The board will co-operate with the Department of Street Railways in making a complete survey of the municipal system with a view to submitting a report and recommendations for future developments.

$338.000 Added to New Orleans Rate Base

Mayor McShane of New Orleans, La, cast the only dissenting vote at the Commission Council meeting on Dec. 26 against the financial report filed by the Public Service Company adding $338,000 to the base amount on which the rate of fare and the income of the company are to be computed. The report, dated as of Sept. 30, raised the rate base to $49,348,226 and showed that the total stock issue permitted at that time under the agreement between the utility officials and the representatives of the city was $8,104,913.

The report, showed that the gross income for September of the street car lines was $670,769; electric power and light, $299,859; gas, $185,266; while the operating expenses were: Street car, $393,011; electric plant, $162,939; gas, $101,198. The total gross income was $1,155,859 and operating expense $657,149, leaving a profit of $498,745, from which were deducted a tax item of $113,568 and uncollectable bills, $1,375, giving a net profit of $409,220 after adding an item for miscellaneous income of $9,535.

From this the company deducted, as allowed by the agreement, $100,000 for renewals and repairs and $71,757 for miscellaneous expense, leaving $238,105 which the report showed had gone back into the funds of the company for additional upbuilding. An additional $100,000 was added to cover payments made on car trust certificates.

$11,360,000 Scheme Probably Dead

Canadian Border Municipalities Vote Against Ambitious Electric Railway Project

The municipalities between Port Credit and St. Catharines, Ont., registered an adverse vote on Jan. 1 of more than $7,500,000, expressed in terms of money, on the hydro-radial scheme for a line between these two points, estimated to cost $11,360,000 odd. As the *Financial Post* of Toronto sees it, unless some ingenious way can be found to revive the proposal and thousands of dollars more are spent in propaganda work to induce balky communities to take another leap the project may be regarded as dead as a door nail.

Under the so-called Drury act the government provided machinery by which interested municipalities could have another chance to declare themselves on the matter if they wished to do so and, further, the government guarantee of bonus to the extent of the $11,360,000 would remain effective should the verdict at the polls be favorable. A stipulation was made, however, that if municipalities representing 15 per cent of the total liability went against the undertaking it would be considered defeated. Fifteen per cent of the total estimated cost of the road would have been slightly more than $1,707,000. What has actually happened, says the *Post*, is that upward of 70 per cent has been rolled up against the venture.

There were thirteen municipaities in all concerned in the original scheme which was first voted on Jan. 1, 1917. Saltfleet and one of the Flamboro townships never would allow themselves to be courted by the Hydro officials from the very first and legislation was got through by which the other eleven places, without a revote of the electors, would be required to absorb the portion of liability which had been charged up against these townships. It seemed for a while as though the radial promoters might get their enterprise through on this basis, but the Sutherland Commission came along in 1921 and by a majority report gave the whole project a black eye. Then the Drury government performed a surgical operation on the hydro-radial act which was in force at that time and created a new act which practically stated that if the qualified voters of the municipalities from Port Credit to St. Catharines were really anxious to invest their millions they could have one more try by voting on by-laws an agreement on Jan. 1, 1923. In order, though, that there might not be any empty dreams about the government's guarantee of bonds to finance the road the Drury administration inserted the 15 per cent disability clause.

The municipalities which went against the scheme with the amounts for which they were to become liable are as follows: Hamilton, $5,869,286; Saltfleet township, $1,002,296; North Grimsby, $424,077; East Flamboro township, $266,626; West Flamboro township, $66,669; and Barton township, $284,484, making a total of $7,913,438, or about 70 per cent of the $11,360,000.

Louisville Carhouse Partly Destroyed

Fire broke out at 11:45 p.m., on Jan. 15 at the Fourth Street carhouse of the Louisville Railway. As a result fourteen double-truck cars, fifteen single-truck cars and six trailers were destroyed, while a number of other cars were slightly damaged. The fire started in one of the cars in the L-shaped carhouse. The loss is estimated at $350,000 by President James P. Barnes, who also reported the company as insured. A few cars were still in service at the time of the fire. Cars on the south side of the house were not damaged to any extent. Most of the loss was of equipment used on the Fourth Street line, but normal service was resumed on the morning of Jan. 16, the first car leaving the carhouse at 4:32 a.m., a temporary dispatcher's office having been established in a car. The company has fifty-five one-man cars on the way from the manufacturers. It doesn't expect to have any trouble in taking care of its service. The work of the fire department was pronounced as being exceptionally good by the officials of the railway.

Conductors Arrested for Using Mutilated Coins

Federal authorities in Chicago, on Jan. 10 arrested two conductors for using mutilated coins with intent to defraud. A claim has been made that conductors were using flattened dimes to beat the fare boxes on the cars of the Chicago Surface Lines. Secret Service agents made an investigation and, as a result, they caught two conductors in the act. These men were Isaac Kraft and John Farrell, who had been in the company's service fifteen years and ten years, respectively. Kraft waived examination, and is said to be ready to plead guilty. Farrell was held for the Grand Jury.

These men were arrested for violation of Section 165 of the Federal Criminal Code, under which they are subject to a fine of $2,000 or imprisonment of five years, or both penalties. It is said that these two conductors flattened dimes so that they had the diameter of a penny and would register as such—thus defrauding the company of 9 cents each time the trick was worked.

The Secret Service agents of the government said this is a serious offense and they have successfully prosecuted conductors under this Section in other cities.

Revised Franchise Will Be Submitted

Resolutions Adopted Seek Old Franchise With Modifications—Bondholders' Approval May Result in New Election in April

Another attempt is to be made to obtain a resumption of street car service in Saginaw, Mich., with motor coach extensions to sections of the city not served in the past by the cars.

A revised franchise that was defeated at the polls Nov. 7, will be submitted. Just how radically different from the other it will be, is not known, as it will depend upon the attitude of the bond owners protective committee of the bankrupt Saginaw-Bay City Railway Company.

Litigation Ended Jan. 10

The litigation in the Circuit Court ended on Jan. 10 when in an opinion by the two judges nearly 1,000 "Yes" votes and several "No" votes were declared invalid. But this action seemed only to spur on the proponents of street cars to try again, and at a subsequent meeting of eighteen civic organizations summoned by the Board of Commerce, resolutions were adopted asking the trustee in bankruptcy, Otto Schupp, to agree to the same franchise with eleven modifications that seemed to be objectional last November. Mr. Schupp has not answered the resolutions, as he is to submit them to the bond owners for their approval.

It is planned, if they meet with the bond owners' approval, to ask the Council to submit the franchise at the election April 2, and if they refuse then start the circulation of petitions to initiate the franchise as was done last November.

The franchise that was defeated provided for the following rates of fare to obtain for two years, ten tickets 50 cents; four tickets 25 cents; 10-cent cash fare; universal transfers. After two years if the Council or the grantee were unable to agree, the Public Utilities Commission was to fix the rate of fare. The term of the grant was twenty-five years, and the company was to be relieved of all paving and repaving but was to pay for all extra ballast necessary because of the construction of its tracks, and was to keep the paving in repair between and 1 ft. outside the outside rails.

New Work Prescribed

Certain new work was to be done and a time limit was fixed. It meant a rehabilitation of the property. As there was some doubt about enforcing that part of the contract which was included by correspondence between Mr. Schupp and the bond owners' committee, the recent meeting incorporated the following in the proposed franchise to be submitted; not less than $400,000 was to be expended for improvements and equipment. The Council is to receive a detailed statement of expenditures and the right for a city audit of the books was included. Two thirds of the board of directors are to be Saginaw men. No by-laws are to be passed to deprive any of the Saginaw directors of their rights under the state law. Provision also is made that the directors hold stock in the company that they may qualify.

Other provisions of the franchise are: That the company is to be distinct from all other local utilities. Books and records are to be kept in Saginaw so they will be available for inspection at all times. That the grantee will in four months resume complete operation. Council given authority to restrict business district operation of freight cars on the Michigan Railroad within one year from date of the acceptance of the franchise. The Council be given the right to require the company to substitute new transportation when initial means becomes obsolete or impracticable. That the franchise may not be construed to restrict or in any way affect operation of motor trucks or taxicabs.

Of the eighteen representatives present seventeen were in favor of the above provisions. The exception was against the last grant and he took the position that disputes and rates of fare should be adjusted at home and not by the utilities commission. He also objected to the length of the grant.

When the franchise was last submitted it lacked the necessary 60 per cent for approval by fifty-seven votes. It is not known what the final count will be made until the board of canvassers completes its work under the Circuit Court opinion. Eight hundred "yes" ballots were declared invalid because of blundering by election inspectors, all but thirty-four votes in one election precinct being thrown out and 296 in another.

Council Opposed to Franchise

The council to a man was opposed to the franchise, yet it attracted an affirmative vote greater than ever accorded any municipal proposition or candidate in the history of the city and the negative vote against the measure is the chronic "no" vote registered against all public matters a study of the votes on various questions shows not only at the last general election but other years as well.

Although the franchise lacked a few votes of adoption on two occasions recently Mayor B. N. Mercer has conferred with George L. Bidwell of New York, president of the Trackless Transportation Corporation, relative to the installation of a motor bus company in Saginaw. As to the progress that has been made nothing definite in regard to the progress of the matter is known, as the chief executive refuses to make any statement on the subject.

It is expected, however, that Mr. Schupp will shortly be prepared to answer the resolutions, at which time, if the resolution can be included in the franchise, an active campaign will be started to have the measure approved by the electors.

Mr. Mitten's Letter to a Stockholder

In a recent issue of "Service Talks" T. E. Mitten, president of the Philadelphia (Pa.) Rapid Transit Company, in replying to a letter from one of the stockholders of the company said in part:

It gives me pleasure to know that you are satisfied with the results secured by this management. The recent retirement of certain efficiency men need give you no concern, since the operating economies which they were brought here to effect have all been accomplished. The work is now being effectively done by carefully trained men, advanced from the ranks, who are in closest sympathy with the Co-Operative Plan.

"One-man management" is a term coined by our adversaries, which can be only truthfully applied if "every-man" is meant. The secret of our present and future success does and must lie in operating officers who are in sympathy with the workers, so that the every-day watchfulness of our 10,000 employees may continue, and their experience be made more and more useful in perfecting our operating practice.

Competent assistants, from the ranks of our own employees are being carefully trained to fill every position of consequence, including my own, to the end that this great work shall go on uninterruptedly, the confidence reposed in me by the stockholders fully justified, and the participation by the men in the ownership of this property intelligently perpetuated.

The loyalty and co-operative efficiency of our employees is unparalleled. These employees are stockholders who have voted to make the payment of the last 10 per cent of their annual wage conditional upon their first having earned and paid the fixed charges of the P. R. T. system and a dividend of 6 per cent to P. R. T. stockholders. This is the greatest possible assurance that the P. R. T. dividend will be continuously earned. Organized labor has no righteous cause against us.

In the matter of P. R. T. publicity, the money cost is believed to be most wisely expended in the advancement and protection of this property. I would ask that you regard these publications as a means of setting forth the facts relating to the various problems confronting this property before the three interested parties—the car rider, the employee and the investor. Only by frank statement and fair dealing has it been possible for P. R. T. men and management to secure such a large measure of public confidence.

New Jersey Governor Raps Utilities

George S. Silzer was inaugurated Governor of New Jersey at Trenton on Jan. 16. In his inaugural address to members of the Legislature the new Governor recommended a legislative investigation to fix the prudent investment value of the various railway properties in New Jersey and predicted that a fare of 5 cents or less would be possible. He bitterly denounced the street railways for watering stock and declared that if they had properly handled their business there would have been no need for an 8-cent fare today. In requesting the lawmakers to investigate the property value of these concerns, he asserted that as he had conceived that value, after study, he was sure it would bring about a 5-cent fare and later a further reduction. This value, however, would, according to the Governor's plan, only be fixed after advice from the Public Utility Commission.

After this proposed investigation the new Governor recommends that a sliding scale basis be adopted for future fare charges. Starting with a 5-cent fare, according to his idea, the companies should be permitted to earn 6 per cent on prudent investment. If the profits increased, then the fare would be reduced to 4 cents and the companies permitted to earn 8 per cent and so on, producing an equitable decrease of fare and a corresponding increase in dividends.

In connection with this attack upon the street railways, the Governor said that the same principles involved should apply to the various light, heat and power companies. In solving this whole problem, he said, there are but two equities to be considered—the security holders and the public—and after carefully weighing the right of both he declared that the equities are in favor of the "innocent public," and asserted that "we must follow the course that brings this result."

Cost-of-Living Chart Presented

The Boston (Mass.) Elevated Railway explains in *Co-operation* for January, 1923, that in July, 1920, Mr. Doherty made an award of 70 cents an hour as the maximum rate for conductors and motormen. It says that in view of the fact that the cost of living as published by the Massachusetts Commission on the Necessaries of Life has, of late months, shown an increase, attention has been directed to the reduction in the hourly rate mutually agreed upon. As in the discussion of the eight-in-ten hour law in the bulletin issued March 15, 1921, it is explained that it is the desire of the management that all questions be considered fairly, intelligently and upon the facts. In consequence it has presented a chart which it says should be the basis upon which consideration of the subject rests.

Directly following the Doherty award, the cost of living declined rapidly, and while during the last few months it has increased, the company says it is about at the same point as in 1918, when the War Labor Board made the award of 48 cents an hour. Examination of the chart also indicates, says the company, that the War Labor Board and the Endicott Award raised the rate per hour to the cost of living line, and the Doherty award raised the rate slightly in excess of the increase in cost of living.

Since that award, the agreements mutually entered into have provided a margin between the downward fall of cost of living and the decrease in rates, so that today, allowing for the change in hours per day, the maximum 61-cent rate is 24 per cent above the cost of living line.

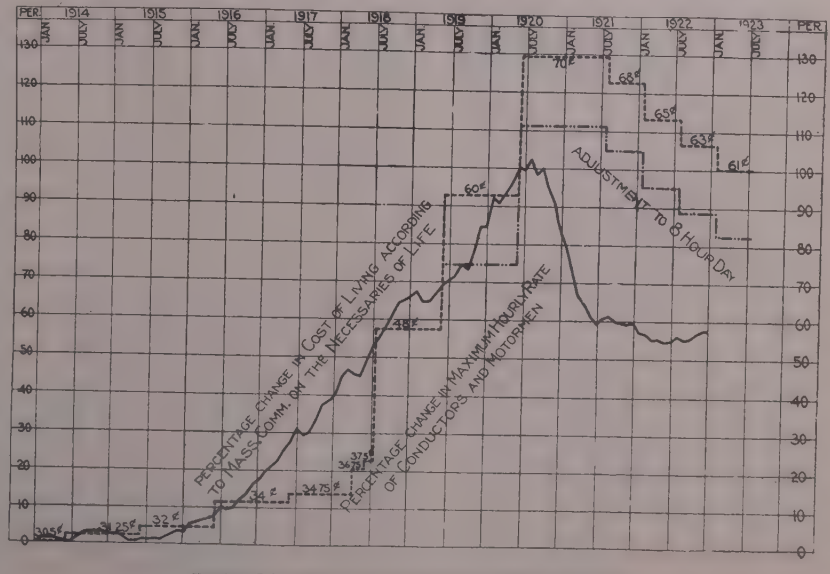
The trustees of the company referred to the reduction being less than the fall in the cost of living as follows:

1. The fact that although a substantial decrease has already taken place in many items affecting the cost of living, that cost is not yet upon any settled basis, so that it is peculiarly a fitting time to put in practice the belief of the trustees that to be consistent they should be as deliberate and conservative in following the cost of living when it is upon a downward trend as in following it when it is in an upward movement.
2. The fact that they thoroughly appreciate the co-operation that the men have given to the management during the past year. The existence of this spirit has financial, as well as other value, in the conduct of this service.
3. The fact that as public officials they are in charge of a public business and should be careful not to follow any other rule than that of a full fair wage for work that is earnestly performed.

It would not seem difficult to keep up the spirit of co-operation and service to the car riders under such conditions nor have much concern for a future which has not as yet arrived.

$1,220 Goes to Safety Teams

The Nashville Railway & Light Company, Nashville, Tenn., distributed a cash bonus of $1,220 last Christmas. This sum was divided among the safety teams which had taken part in the accident reduction contest starting Oct. 1 and ending Dec. 19. The number of accidents for the year just ended, namely 1,680, shows a reduction of 489 as compared with the 1921 total. It was pointed out by railway officials that these figures are significant in view of the fact that traffic and congestion had increased considerably in 1922 due to the increased number of automobiles.



Boston Elevated Cost of Living and Wage Chart

Financial and Corporate.

Receiver for Queens Line

Company Has $7,694,394 of Unfunded Debt—Interborough Advanced Company $7,000,000 — Will Quit Now

Gen. Lincoln C. Andrews, who has been executive officer of the New York Transit Commission for the last two years, was appointed receiver for the New York & Queens County Railway on Jan. 18 by Justice James C. Van Siclen in the Supreme Court, Long Island City. Application for the receivership was made by W. W. Green of Alexander & Green, attorneys for the Bankers' Trust Company, trustees for outstanding bonds of the company.

ROAD A DRAIN ON INTERBOROUGH

The New York & Queens County Railway is a subsidiary of the Interborough Rapid Transit Company and the application for a receivership followed the recent declaration of Colonel Grayson M. P. Murphy, the new chairman of the executive committee of the Interborough board of directors, that the Interborough Company would no longer pay the recurring deficits of the Queens County Company but would concentrate its resources in improving its existing rapid transit facilities and in co-operating with the public authorities to build new lines.

Announcement to this effect was made on Jan. 15 by Colonel Grayson M. P. Murphy, the new chairman of the executive committee of the Interborough board of directors, following a conference with a delegation of residents of Queens. Colonel Murphy promised the Queens residents that the Interborough would co-operate in every way in the reorganization of the company and would continue to furnish it power to prevent any break in operation.

$781,000 NEEDED FOR IMPROVMENTS

The New York & Queens County Railway now owes $350,000 in taxes and the city has judgments for paving amounting to $237,206. The total unfunded debt of the company is $7,694,394.

The three controlling reasons which impel the Interborough Company to take action now are these:

1. For the Interborough to continue the operation of the Queens County lines will require a further advance of funds for both capital expense and to make up deficits. The Interborough management feels that all their resources should be devoted to improving the service of the subway and elevated.
2. The Interborough management has come to the conclusion that its sole function should be that of providing rapid transit and that accordingly it would relieve its officers of the responsibility for the management of lines which present a different and a difficult problem in themselves.
3. In view of the foregoing, the Interborough company should retire immediately and allow an independent interest to obtain possession of this property and thus develop it for the promotion of public convenience.

Some idea of the drain which the Queens County system has been upon the Interborough can be gathered from the fact that during the past twenty years the Interborough has advanced to the Queens County lines nearly $7,000,000. During all of these years there has been a substantial operating deficit, and in 1922 the receipts from the operation of the Queens County lines were $450,000 less than the actual expense for operation.

The Transit Commission's engineers have estimated that $781,000 of new money will be needed to put the lines in first-class operating condition. The most valuable parts of the system, the Steinway lines, comprising practically all the tracks east of Woodside and separating the lines now operated by the company from Manhattan, are being operated under a receivership obtained by the holders of the underlying bonds of the old Steinway Railway. Passengers traveling over the two parts of the once united system now not only have to pay two fares but to change cars. Slaughter W. Huff, president of the Third Avenue Railway, and Robert C. Lee are receivers of the Steinway Railway.

Preferred Stock Payment Plan Announced

The directors of the Alabama Traction Light & Power Company, New York, N. Y., have proposed to the holders of the $1,000,000 of 6 per cent preferred stock a plan for funding the accrued dividends in order to permit of the payment of future dividends in cash. A provision is made that any shareholder who is unwilling to accept payment in stock will receive an undertaking from the company to pay such dividends in cash at a future date. A dividend of 48 per cent has been declared on the preferred stock covering the cumulative dividend periods to Dec. 31, 1922, payable to shareholders of record on that date on surrender of the warrants either in preferred stock at par or on or before Dec. 31, 1925, in cash without interest. Option of exchange must be exercised before Aug. 1, 1923. All new stock issued in payment of dividends to shareholders exercising this option will be entitled to 6 per cent dividends cumulative from the date of issue.

Dismantling Work Under Way

Work of dismantling the Springfield & Washington Railway, operating between Springfield and South Charleston, Ohio, was started Jan. 2. Order permitting the company to discontinue service on the line Dec. 31 was issued some weeks ago by the Ohio Public Utilities Commission.

All of the material with the exception of 3 miles of track will be sold as junk. These 3 miles of track will be used by the Baker Wood Preserving Company to provide switching facilities.

Refinancing Plan Made

American Railways Would Pay Accumulated Dividends on the Preferred Stock in Additional Stock

Plans have been announced for refinancing the American Railways, Philadelphia, Pa. Accumulated dividends amounting to 19¼ per cent on the $4,000,000 (par value $100) 7 per cent first preferred stock of the company will be paid in additional preferred stock if two-thirds of the holders of the common and preferred stocks of the company approve.

Future quarterly payments on the first preferred stock also will be paid in the same manner until there has been accumulated out of earnings after Jan. 1, 1923, a surplus of $1,000,000. Thereafter, the plan states, if earnings of the company warrant, cash dividends on the preferred stock will be resumed. A special meeting of stockholders will be held in Camden, N. J., on Feb. 1 to act on the plan.

The plan also provides for sale by the company of all its common stock equity in the Ohio Valley Electric Railway, Ironton Electric, Boyd County Electric, Lynchburg Traction & Light and Roanoke Traction & Light Companies to the Consolidated Light, Heat & Power Company, which is owned by the American Railways.

The Consolidated Company will issue approximately $7,000,000 of bonds and $1,500,000 of cumulative 7 per cent preferred stock, the proceeds of the sale of these securities to be used in paying the American Railways for the stock of the other companies, a total of approximately $7,500,000, the remainder to be used for installation of new power equipment.

The plan further provides for redemption of $3,000,000 of 7½ per cent gold notes of the American Railways due Feb. 1, 1925; retirement of not less than $1,000,000 of its five-year 8 per cent notes; extension of the Wilmington & Chester Traction Company collateral trust gold extended 6s, due April 1, 1923; retirement of the $4,000,000 second preferred stock and an increase in the authorized first preferred stock from $4,000,000 to $8,000,000, and a change in the name to the American Electric Power Company.

Van Horn Ely, president, in a letter to shareholders, says:

> The directors unqualifiedly recommend to the stockholders approval of the plan for refinancing, which in their judgment is a constructive one and places the company on a firm financial basis. The company has concluded arrangements with bankers who have agreed, subject to the satisfactory completion of the foregoing plan, to undertake the formation of a group for the purchase of all of the securities involved.

The directors of the company, according to Mr. Ely, are firm in the conviction that, if the earnings continue during 1923, as they have indication of so doing, the necessary surplus to warrant resumption of cash dividends on the preferred stock will be reached before the close of this year.

Approximately $11,000,000 of new securities will be issued under the plan.

Ordinance Defers Tax Payment

With four negative votes and after an address by Councilman Edwin Kellogg, the Council of Cincinnati, Ohio, on Jan. 10 passed an ordinance deferring for six months payment of the $350,000 franchise tax provided for in the service-at-cost franchise granted the Cincinnati Traction Company.

Councilman Martin referred to the fact that the recommendation for the deferment had been made to the Council by Mayor George P. Carrel's traction committee, members of which were of the opinion that an increase in fares resulting from a refusal of the Council to defer payment of the tax might seriously interfere with the adjustment of the traction problem. He also called attention to the fact that before the city could obtain any part of the money due under the franchise the company would collect $160,000 due it as earnings under the franchise.

He said further that the deferment ordinance was introduced merely as a riding over measure until committees representing the Cincinnati Traction Company and the Cincinnati Street Railway could agree on a basis for the reorganization of the two companies. He promised that when that time came a new ordinance would be passed to take the place of the present service-at-cost ordinance which would eliminate parts of the ordinance now found to be objectionable.

Bankers Suggest Purchase Terms Be Arbitrated

E. M. Sanderson, of Sanderson & Porter, was one of the delegation that waited on the members of the City Council of St. John and later on the government of New Brunswick in St. John, N. B. Others in the delegation were Henry R. Hayes, of Stone & Webster, New York City, chairman of the public utilities securities committee of the Investment Bankers' Association of America; O. B. Willcox, New York, counsel of the Investment Bankers' Association of America; R. D. Bell, Montreal, and E. C. Long, Toronto, representing the Bond Dealers Association of America, the former being the chairman of the public utilities committee of that body.

The members of the delegation asked the members of the City Council of St. John to arbitrate the dispute between the city and the New Brunswick Power Company over the question of purchasing the undertaking, and suggested a higher value in the street railway property than that fixed by the city. The city's offer of $2,577,665 for street railway, gas plant, electric light and power plant and real estate was pronounced much too low. Several of the members of the City Council agreed to the view that the price was too low, but refused to listen to the suggestion that the dispute be submitted to arbitration. The delegation told the members of the City Council that continued hostility to the New Brunswick Power Company and refusal to offer a figure higher than the sum named for the property would create an unfavorable feeling against St. John in financial circles.

At the meeting with the New Brunswick government, the delegation endeavored to induce the government to interfere and demand that the members of the City Council of St. John submit the controversy to arbitration. This the government has refused to do, stating the dispute is one wholly between the city of St. John and the public utility corporation.

Tentative Plan Drawn for B.R.T. Reorganization

A tentative plan for the reorganization of the Brooklyn Rapid Transit system formulated by protective committees for the two principal securities —$74,520,000 stock and $57,230,000 gold notes of 1921—has been submitted for consideration to committees representing other securities of the system. This is a step forward in the reorganization, which is not yet in shape for announcement of details.

According to the *Wall Street Journal* the tentative plan provides for a new issue of 6 per cent collateral trust bonds to replace existing 7 per cent gold notes of 1921, the exchange to be accompanied by partial payment in cash of accumulated interest since June, 1919. New bonds, if the tentative plan is adopted, will be secured by New York Municipal Railway first 5s, at present pledged under the notes. B. R. T. 5s of 1945 and the first refunding 4s of 2002, it is believed, are similarly to be replaced by the new 6s. The latter issues, owing to pending litigation involving priority of property liens, will require extensive negotiation before an agreement can be reached, but it is hoped by July 1, next, to have secured agreement of all interests. The amount of cash payable to noteholders has not been finally agreed upon; cash payments to B. R. T. 5s and 4s cannot at the present time be estimated with accuracy.

Stockholders, under terms of the tentative plan, will be asked to subscribe for new securities, principally collateral trust 6s, to the extent of approximately $35 for each share held.

Auction Sales in New York.—At the public auction rooms in New York, there were no sales of individual electric railway securities this week.

Would Tax Net Income.—A petition filed by D. A. Baldwin with the State Legislature on Jan. 11 asks that a tax be placed on the net income of electric railways of Massachusetts instead of the present franchise tax.

Abandonment Approved.—The stockholders of the Brooklyn (N. Y.) City Railroad on Jan. 8 approved the resolution which provided for the abandonment of the company's line beginning at the intersection of Furman Street with Fulton Street along Furman Street to Atlantic Avenue, Brooklyn, N. Y.

Authorizes Disposal of Certificates.—The Northern Massachusetts Street Railway, Athol, Mass., has been authorized to dispose of $25,000 of receiver's certificates. It was shown that unless the company was enabled to borrow money to pay certain bills it would have to cease operating its lines, which serve the section from Orange to Fitchburg.

Wants to Issue Bonds.—Pacific Gas & Electric Company Sacramento, Calif., has applied to the Railroad Commission for authority to issue $5,490,000 face value of its general and refunding mortgage gold bonds and to deposit and pledge them with the Mercantile Trust Company under the terms of the company's first and refunding mortgage.

Railway Reorganized. — The York (Pa.) Railways reorganized on Jan. 8 and elected the following new directors: George E. Baker, Gordon Campbell, L. B. Harvey and Joseph W. Swain. A statement was issued showing the York Railways and its allied public utility corporations expended during the past year for improvements $30,000.

Date on Valuation Argument Announced.—The Missouri Public Service Commission has set Feb. 15 as the date for the argument in the United Railways of St. Louis valuation case. Action was taken on request of former City Counsellor Caulfield, special attorney for the city, who asked for additional time to reply to company's brief.

Line Bought.—The Chicago, Aurora & De Kalb Electric Railroad, Aurora, Ill., was recently bought at a mortgage foreclosure sale in Geneva for $90,000. It was bought by Israel Joseph, an iron dealer of Aurora. The line is 31 miles long and runs between Aurora and De Kalb. The new owner did not state whether he would junk the line or operate it.

Lake Pontchartrain Road Elects Directors.—At the recent annual meeting of the Jefferson & Lake Pontchartrain Railway, a subsidiary of the New Orleans Public Service Company, Inc., the following directors were elected for the ensuing year: R. S. Hecht, J. P. Butler, Jr., J. D. O'Keefe, Hugh McClosky, Joseph D. DeGrange, Harold Newman, A. D. Parker.

To Sell Preferred Stock.—A license has been granted by the state securities commission to the Salt Lake & Utah Railroad, Salt Lake City, Utah, to sell 500 $100 shares of its 7 per cent cumulative preferred stock at a discount of $5 a share. A sales commission of 3 per cent has been granted by the commission. The proceeds of the stock sale will be used for new construction work.

Gold Bonds Offered.—A $3,000,000 offering is being made of the first lien and refunding 6½ per cent gold bonds of the Central Power & Light Company, St. Louis, Mo. Upon completion of this financing the company will operate directly or through its subsidiaries thirty-two central electric power stations and do a gas, water and street railway business in sixty-three cities.

Net Income $1,258,487.—The Market Street Railway, San Francisco, Calif., for the eleven months ended Nov. 30, 1922, reports a railway operating revenue of $8,744,616 and expenses $6,288,408. The net income, which included no provision for federal income tax, sinking fund or betterments, amounted to $1,258,487.

Traffic Decreases.—According to the annual report of the Nashville Railway & Light Company, Nashville, Tenn., there was a falling off in traffic in 1922 compared with 1921. There were 34,000,000 passengers in 1922 which represents a loss of 5 per cent. The mileage operated was approximately 5,350,000 miles which showed an increase in service rendered during the year.

Authorizes Abandonment.—On Sept. 26, 1922, the California State Railroad Commission authorized the Pacific Electric Railway to abandon a portion of its single-track line, 2.3 miles in length, and known as the Terracina line in the city of Redlands. That portion of the Terracina line abandoned was producing so little traffic as to justify discontinuance of service. The railway company has taken up its tracks.

Falling Off in Receipts.—In his annual message to the stockholders for the year ending Nov. 30. 1922, Gordon Campbell president of the York (Pa.) Railways states that the decrease in traffic from the peak of 1920, continued in the railway practically to the end of 1922. It was then that the normal increase appeared to show itself. Compared with 1921 the railway receipts showed a decrease of about $20,000.

Special Dividends Declared.—The Columbus Railway, Power & Light Company, Columbus, Ohio, has declared a special dividend of 2½ per cent on the outstanding common stock payable Jan. 20 to holders of record on Jan. 10. No dividends on the common stock have been paid since 1917 when the quarterly dividend payments of 1¼ per cent starting in May, 1914 were terminated.

Five Months Income Reported.—The passenger revenue of the Brooklyn (N. Y.) City Railroad for the five months ended Nov. 30, 1922, was $4,861,766 against $4,685,461 for the same period in 1921. Operating expenses and taxes increased from $3,956,568 to $4,016,433 for the five months ended Nov. 30 of this year. The net corporate income amounted to $783,016 against $633,876 for the period ended Nov. 30, 1921.

Gold Bonds Offered.—Fletcher American Company, Indianapolis, and Illinois Trust & Savings Bank, Chicago, recently offered $973,000 twenty-five year first mortgage 6 per cent gold bonds of the Indianapolis, Columbus & Southern Traction Company, Columbus, Ind. The price was 100 and interest. The bonds are dated Feb. 1, 1923, and are due Feb. 1, 1948. The purpose of the offering was to refund an issue of first mortgage 5 per cent bonds due on Feb. 1, 1923.

Debenture Bonds Offered.—Bonbright & Company New York, N. Y., are offering at 90 and interest to yield about 6.70 per cent $2,500,000 gold debenture bonds of the United Light & Railways Company, Grand Rapids, Mich. The bonds, known as Series "A" 6 per cent, are dated Jan. 1, 1923, and are due Jan. 1, 1973. The proceeds will provide funds for the retirement of the 8 per cent bond-secured gold notes due Nov. 1, 1930, which will be called for redemption at once.

Will Increase Common Stock.—The Indiana Public Service Commission has authorized the Lafayette (Ind.) Street Railway, Inc., to increase its common stock from $125,000 to $200,000 and to issue $200,000 of twenty-year 7 per cent bonds. The corporation will withdraw and cancel its $125,000 of preferred stock which was authorized but never issued. The new securities issue was authorized, it is said, to reimburse the company for capital expenditures made or contemplated.

Stock Issue Authorized.—The Alabama Traction Company organized by John B. Weakley, Birmingham, and associates to take over the electric railway systems in Albany and Decatur, Ala., was granted authority by the Public Service Commission to sell $50,000 in common stock of the company and to issue $150,000 of twenty-year 6 per cent mortgage bonds. The first mortgage bonds will be used in acquiring the property of the North Alabama Traction Company under the court's approval.

Property Transfer Made.—On Jan. 8 the Tiffin, Fostoria & Eastern Electric Railway transferred its property to the Tiffin & Fostoria Railway, recently organized to take over the line. C. F. M. Niles, Toledo, is president of the new company and Samuel B. Sneath, Tiffin, is secretary. Mr. Sneath was also secretary of the Tiffin, Fostoria & Eastern. The consideration was $175,000, and the new company filed a mortgage for that amount to the Ohio Savings Bank & Trust Company, Toledo. No change in management is involved in the transfer, the line remaining virtually under the same ownership.

Warrant Basis Date Announced.—City treasurer and city comptroller of Seattle, Wash., have announced that Seattle's Municipal Railway fund will go on a warrant basis on Jan. 25, instead of Jan. 10, as first planned. With the fund on a warrant basis, employees will be unable to cash warrants with the treasurer, and banks will probably only cash them at a discount. A bond interest and redemption payment of $1,243,975 is due Feb. 1. Of this amount, $833,000 will be for bond redemption. This calculation does not take into consideration the payment of warrants Jan. 25, which will be approximately $275,000.

Line Sold.—The Millers Falls branch of the Connecticut Valley Street Railway, extending from Turners Falls to Millers Falls, Lake Pleasant and Montague, Mass., has been sold to Michael Blassburg, a junk dealer, of Turners Falls, who is about to dismantle the property. The branch was opened to traffic in June, 1895, and was prosperous for a time. The first setback was met with in the revoking of boating and fishing privileges on Lake Pleasant, and the rise of the automobile and the motor bus brought the branch to a condition regarded as hopelessly unprofitable. Service was discontinued recently.

1922 Better Than Previous Year.—The Stark Electric Railroad, Alliance, Ohio, carried 3,142,949 passengers in 1922. This was 348,600 more than in 1921. The banner month of the year was December when 296,169 were carried. In December, 1922, 9,000 more passengers were carried in the city than in the previous year. The income for passenger traffic for the year 1922 was about $20,000 less than the income of the previous year. This was caused mainly by the reduction of fares in Canton and Alliance and the issuance of tickets between Louisville and Canton. Though the receipts from fares are less yet the gross receipts the past year were greater than the year previous. There were fewer accidents in 1922 than in 1921.

Abondonment Order Issued.—Orders for the immediate abandonment of the New Carlisle junction branch were issued by Federal Judge Killits in Toledo, Jan. 15, according to announcement from the local headquarters of the Indiana, Columbus & Eastern Traction Company. The order comes as confirmation of a decision of the State Public Utilities Commission, set to go into effect at midnight Dec. 31, last, but held up by protests of residents along the line. At the same time, Judge Killits gave protestants to the abandonment of the Lima-Defiance division until Feb. 1 to raise funds to purchase the branch, after which date, unless sold, the Indiana, Columbus & Eastern is authorized to abandon service. No decision has been handed down in the case of the Columbus-Orient branch.

Northern Ohio Electric Report Shows Big Gain.—The Northern Ohio Electric Corporation, Akron, Ohio, in its annual report for 1922 shows net income of $122,544, or $1.63 a share, earned for the 75,000 shares of common stock outstanding. This compares with a deficit of $117,741 in the preceding year. Gross revenues totaled $9,354,964, a gain of $682,886 over 1921, but $1,659,881 less than in 1920, the record year. Net after taxes was $2,457,191, and the balance after charges, but before depreciation and preferred dividends was $482,544. After allowing for dividends on the preferred, none having been paid since Dec. 1, 1919, there was net of $122,544 available for the common. Bank loans were reduced by $720,000 in 1922, partly by the use of funds derived from sale by the Kent Water & Light Company of its electric property to the Northern Ohio Traction & Light Company. The balance sheet shows cash of $23,874 and securities $9,762,222. Notes payable stand at $2,880,000, construction reserve $232,786 and surplus $179,139.

Traffic and Transportation

Through Routes and Joint Rates

Père Marquette Required to Meet Demands Made Upon It by the Michigan Railroad

The Michigan Railroad has won a victory before the Interstate Commerce Commission over the Père Marquette Railroad and others. The commission has entered an order requiring the Père Marquette Railroad to establish through routes and joint rates in connection with complainant between points on complainant's line in the State of Michigan, namely Saugatuck, Vriesland, Forest Grove, Jamestown and Frankenmuth and certain interstate points on defendant's lines.

COMMISSION'S ORDER QUOTED

In the commission's own words:

We find that complaint (Michigan Railroad) is engaged in the general transportation of freight and that, subject to the above limitations, through routes and joint rates between Saugatuck, Vriesland, Forest Grove, Jamestown and Frankenmuth and various interstate points on defendants' lines are necessary and desirable in the public interest.

We will accordingly require defendants to establish in connection with complainant between Saugatuck, Vriesland, Forest Grove and Jamestown on both carload and less-than-carload traffic, and Frankenmuth on carload traffic, on the one hand, and the interstate points from and to which through routes and joint rates are at present maintained in connection with complainant's Allegan-Battle Creek division on the other hand, through routes and joint rates which, as to traffic destined to points on complainant's lines, will not short-haul its connections, and which, as to traffic from points on complainant's lines, will reserve to complainant its long haul; provided, however, that such through routes and joint rates are not hereby required to be maintained over circuitous routes.

The commission said that the record did not afford sufficient basis to enable it to prescribe reasonable rates or divisions of rates in connection with these routes and that if complainant and defendants are unable to agree upon reasonable rates, as well as just, reasonable and equitable divisions thereof, the matter may again be brought to the commission's attention.

The electric road operates lines wholly within the State of Michigan, extending from Saugatuck on Lake Michigan, through Holland, northeasterly to Grand Rapids, a distance of 44.8 miles; from Grand Rapids southerly through Monteith to Kalamazoo, 49.7 miles; from Battle Creek northwesterly, through Monteith on complainant's Grand Rapids-Kalamazoo division, to Allegan, a distance of 42.5 miles. and from Flint northerly through Saginaw to Bay City, with a spur to Frankenmuth, a total distance of 65 miles. The company's Flint-Bay City line has no physical connection with its other lines.

Practically all the steam carriers in the United States were parties defendant. The electric road or its predecessor started its freight business in September, 1913, by the purchase of the Allegan-Battle Creek line from the Michigan Central. Through routes and joint rates are maintained by defendants in connection with complainant from and to all points on this line; the complainant having succeeded to the Michigan Central's tariffs.

In the proceeding just decided the electric road applied under section 15 of the interstate commerce act for the establishment of similar through routes and joint rates from and to points on its Saugatuck-Grand Rapids and Grand Rapids-Kalamazoo divisions, and on its Flint-Bay City division between Mount Morris and Bridgeport, and asked that the Interstate Commerce Commission prescribe the divisions of such rates. It alleged that the failure and refusal of defendants to establish such routes and rates constituted violations of section 1, paragraph 4; section 2 and section 3, paragraph 3, of the act, but it adduced no evidence in support of the alleged violations of section 2.

In its decision the commission said that the right of the electric road to relief under section 15 depended upon whether it engaged in the general business of transporting freight in addition to its passenger and express business, and was able to maintain in connection with defendants the through routes and joint rates prayed for; whether such through routes and joint rates were necessary or desirable in the public interest; that is, whether they were practicable and would substantially serve the convenience of the public; and whether by the establishment of such routes any of the defendants would be short-hauled.

Railway to Install Bus Service

East St. Louis Railway, East St. Louis, Ill., will install motor bus service about March 15 on a crosstown route, according to an announcement by President W. H. Sawyer. Three buses have been purchased. The rates of fare will be 8 cents, the same as on the electric railway cars, and transfers between buses and trolleys will be issued. Mr. Sawyer stated the bus service was an experiment and was made because it was inexpedient to extend the railway service at this time and that a crosstown trolley line was still a future possibility.

Will Provide Bus Service. — President Clark V. Wood of the Springfield (Mass.) Street Railway has indicated his willingness to provide a supplementary service by auto on condition that all jitneys now run are barred by the city. Mayor Leonard has approved such arrangement. The proposition will be put into shape for formal action by the City Council and the company. The term for which jitney licenses has been granted will expire on May 1.

49,036,746 Passengers at One Station

Compilation Made by New York Commission Shows Staggering Totals Handled at Busiest Traffic Points

Times Square and Brooklyn Bridge are the principal centres of rapid transit traffic in New York City. This statement is based on figures compiled from the reports of ticket sales at the various stations of the rapid transit lines of both the Interborough and Brooklyn Rapid Transit systems to the Transit Commission. The figures are for the fiscal year ended June 30 last. They were made public on Dec. 9.

While the ticket sales for both systems at Times Square, 49 036,746, are about 2,500,000 less than those at the Brooklyn Bridge centre, the latter includes not only the subway figures at the Brooklyn Bridge station, but the ticket sales of the Brooklyn elevated lines and the Second Avenue and Third Avenue elevated railroads there and the sales at the Chambers Street terminal of the B. R. T. system under the Municipal Building.

Considered as a subway centre alone Times Square is far in the lead, 49,036,746 of ticket sales being contrasted with 14,984,289 at the Interborough Subway's Brooklyn Bridge station and 13,238,249 at the Chambers Street terminal of the B. R. T. under the Municipal Building, a total of 28,222,538 subway ticket sales at Brooklyn Bridge.

TIMES SQUARE TRAFFIC HEAVIEST

The Times Square figures, in addition represent a greater traffic concentration as the passengers who enter both systems at that point pass through the same entrances and passageways for the most part. The Times Square station is the largest, from the viewpoint of traffic, on the Interborough subway system with ticket sales of 31,966,237 for the year, more than 2.000,000 more than at Grand Central. The Times Square station is also the largest on the B. R. T. system, the ticket sales for the year having totaled 17,070,509.

If the number of passengers who leave the trains at Times Square be considered equal to the number who board trains there, then in the last fiscal year the number of persons who passed through the Times Square entrances and passageways to and from the interconnected Interborough and B. R. T. stations was equal to a figure only a few millions less than the population of the United States.

The Interborough traffic at Times Square represented an increase of 2,396,977 over 1921. The increase at the B. R. T. Times Square station was 2,495,936. In 1921 the Interborough traffic at Times Square exceeded that at Grand Central by only 170,000—these two being the leading Interborough stations — but in 1922 the ticket sales at Times Square sprang ahead and exceeded the sales at Grand Central by 2,028,000.

The Interborough fare collections—this term being interchangeable with ticket sales, which were partly discontinued by use of the new turnstiles—at Times Square alone were greater than upon the entire length of several of the subway branches, exceeding both the Queensboro subway and the Eastern Parkway line by several millions.

BROOKLYN BRIDGE FIGURES

Of the total traffic at the Brooklyn Bridge center, 13,908,471 were upon the Brooklyn elevated lines, 14,984,289 upon the Interborough subway, 13,238,249 at the Chambers Street terminal of the B. R. T., 3,408,400 upon the Second Avenue Elevated and 6,219,200 upon the Third Avenue Elevated.

Other important rapid transit centers follow:

FOURTEENTH STREET-UNION SQUARE	
I. R. T. Lexington Ave. subway	16,966,522
B. R. T. Broadway subway	14,721,993
Total	31,688,515
GRAND CENTRAL STATION	
I. R. T. Lexington Ave. subway	29,938,128
I. R. T. 3d Ave. "L"	1,290,300
Total	31,228,428
ATLANTIC AVENUE	
I. R. T. station	15,545,431
Pacific Street station	7,513,686
Brighton Line station	1,594,226
Fifth Ave. "L" station	1,513,829
Total	26,167,172
BOROUGH HALL	
I. R. T. station	13,845,912
Court Street B. R. T. station	3,534,821
Boerum Place "L" station	1,163,904
Myrtle Ave.-Court St. "L" station	923,772
Total	19,468,409

The largest stations, from the standpoint of traffic, on the Interborough subway system, follow, with the figures of tickets sold or fares collected in the fiscal years of 1922 and 1921.

	1922	1921
Times Square	31,966,237	29,568,260
Grand Central	29,938,128	29,397,748
Pennsylvania Station	25,009,251	23,071,850
14th St. (E. S. subway)	16,966,522	15,862,000
Atlantic Avenue	15,545,431	19,929,720
Brooklyn Bridge	14,984,289	15,238,000
Borough Hall	13,845,912	14,898,200
Fulton Street	13,530,045	14,803,100
14th St. (W. S. subway)	10,949,399	10,093,000
86th St. (E. S. subway)	10,266,101	10,161,200

The most important stations on the Interborough's elevated system were at Grand Street on the Third Avenue line with ticket sales of 7,534,600, a loss of about 330,000 for the year, Thirty-third Street on the Sixth Avenue line, which had 6 965,400, a loss of about 460,000, and City Hall on Third Avenue line, with 6,219,200, a loss of 364,000.

The busiest stations on the B. R. T. subway system follow, with comparative figures for 1922 and 1921:

	1922	1921
Times Square	17,070,509	14,574,573
34th Street	14,723,077	12,666,574
Union Square	14,721,993	12,850,863
Brooklyn Bridge (Park Row)	13,908,471	14,799,521
Coney Island Terminal	13,868,226	12,116,339
Chambers Street	13,238,249	13,754,998
Essex Street	11,126,708	10,040,297
Cortlandt Street	10,466,274	8,467,507
De Kalb Avenue	9,552,077	7,862,448

The total Interborough subway traffic last year was 644,975,474, a gain of about 5,000,000, and its total elevated traffic was 384,517,216, a loss of about 25,000,000. The total B. R. T. traffic, which is not segregated as to subway and elevated lines, because of joint operation, was 444,747,229, a gain of a little less than 40,000,000.

Six-Cent Fare Extended

Council of Binghamton Renews Railway Agreement—Order for Two Men on Car Rejected

Six cents will be the fare charged by the Binghamton (N. Y.) Railway until Jan. 15, 1924. The extension of the present fare agreement between the city and the company was authorized by the Common Council at the adjourned session on Jan. 12. An amendment to make it compulsory for the company to have crews of two men on each car was voted down.

The ordinance was adopted by seven votes, with three Aldermen opposed and three Aldermen absent. Seven votes were needed. The amendment was lost with seven voting against it, three opposed and three absent.

Previous to the action on the ordinance of Alderman Edward F. Roman on the 6-cent fare agreement, the special committee named to confer with the officials of the Binghamton Railway presented a lengthy report.

The report contained a statement of assets and liabilities of the company and the railway income account for the first eleven months in 1922, showing the net corporate income to be $41,723 and the operating expenses to be $595,339. The total bonded debt of the company is now $2,423,565.

TELL OF SAVING EFFECTED

In the report it is stated that the company effected a saving of approximately one-half cent per kilowatt by bringing power from Dalton, Pa., but the officials claim some of this saving does not show, as the new cars take more power. The cost of this improvement, it is stated, has not been charged to expense, in fact, has not been paid for as yet, as the company had an agreement with the concern doing the construction work that it was not to be paid for until the company was out of the hands of the receiver. The report also states that there have been no unwarranted expenses or increase in salaries of officers.

The committee also reported that the company has a considerable source of income from lighting contracts but the officers state and the figures show, the report says, that all of this has been used to pay for improvements and debts of the street railway system. In 1921 the railway made a profit of $31,301. In eleven months in 1922 the company had profits of $41,723.

The company's records show a remarkable decrease in business in 1922 as compared with 1920, as the company carried 328,469 fewer passengers in 1922 than in 1920. This is explained in part by the fact that there were 8,000 automobile licenses issued in 1920, in Binghamton, as compared with 16,000 in 1922.

The scale of wages on Jan. 1, 1920, was 41-45 cents.

The present scale is the same for the two-man cars and 46-50 cents for the one-man cars.

In January, 1920, 174 men were employed on the cars.

At present 122 men are employed and actually running cars.

In January, 1920, fifty-two cars were available and in use.

At present sixty-nine cars are available and in use.

In 1920 1,987,904 car-miles were made as compared with 2,182 258 in 1922, an increase of 184,454 car-miles.

There were eleven fewer boarding and alighting accidents reported in 1922 than in 1920, and eighty-seven more automobile accidents.

Every car is thoroughly inspected every 1,000 miles and every 50,000 miles the cars are taken down from the trolley to the ground and all necessary repairs made. Care are repainted every eighteen months.

Boston Fare Policy Indorsed

"Neither sense, justice nor expediency" supports the suggestion of a 5-cent fare on the Boston Elevated Railway, according to the State Department of Public Utilities, which has filed with the Legislature a lengthy report on the transportation situation in Boston and surrounding cities and towns. As for Mayor Curley's proposal that any deficit in the cost of operation at a 5-cent fare be paid out of the tax levy of the cities and towns served by the company the suggestion is ridiculed.

The department indorses the present proposition of having the Elevated operated on the service-at-cost basis, under public trustees, and while opposing strongly the general 5-cent fare, approves the plan of establishing such a fare within certain zones, in accordance with the plans already put into effect by the trustees in certain cases.

The department recommends the establishment of a Metropolitan Transportation District to take over the lines of the Eastern Massachusetts Street Railway in East Boston, Chelsea and Revere and lease the same to the Boston Elevated. The longest haul on these lines would be approximately 4 miles.

The department recommends also the establishment within the metropolitan district commission of a metropolitan planning division, which would consider the whole subject of transportation and make recommendations from time to time as to improvements that might be effected in local service.

The department recommends further that street railways should be relieved of the payment of all commutation taxes and should also be relieved from the expense of paving streets between rails. It believes that the subway rentals should be continued.

The recommendations of the commission will be reviewed at length in an early issue of the ELECTRIC RAILWAY JOURNAL.

Personal Items

A. E. Reynolds Joins Sanderson & Porter

Albert E. Reynolds, who recently resigned as general manager of the United Traction Company, Albany, N. Y., and its subsidiaries, will become associated with E. N. Sanderson of New York in the operation of gas, electric light, power and street railway properties. Mr. Sanderson is senior member of the firm of Sanderson & Porter, well known engineers and contractors, and is president of the Federal Light & Traction Company, which operates public utilities in various cities of the United States, with the principal office in New York City.

Mr. Reynolds began his railway career with Sanderson & Porter when they owned and operated the Plattsburg Traction Company at Plattsburg. He remained with the firm for eleven years, when the Plattsburg company was purchased by the Delaware & Hudson Company.

His work in the organization and operation of the Plattsburg road won recognition from its new owners, and in 1909 he was transferred to Glens Falls, where he was promoted to general manager of the Hudson Valley Railway, a subsidiary of the Delaware & Hudson Company. In 1917 Mr. Reynolds was promoted to the general managership of the United Traction Company, the largest of the Delaware & Hudson electric lines. He also retained the general managership of the Hudson Valley.

Dean J. Locke with Public Service Railway

Dean J. Locke will enter the service of the Public Service Corporation of New Jersey on Feb. 1 as special engineer attached to the office of R. E. Danforth, vice-president and general manager of the Public Service Railway. Mr. Locke was graduated from the Worcester Polytechnic Institute in June, 1912, with the degree of B. S. in electrical engineering and since then has been in the employ of Albert S. Richey. He received the degree of electrical engineer at Worcester Polytechnic Institute in 1916. The work that Mr. Locke did for Mr. Richey was very broad in its character, including the conduct of car and equipment tests, the making of traffic surveys, the preparation of studies of wage trends and living costs and the interpretation of valuation data. In fact, Mr. Locke was resident engineer in entire charge of the inventory and appraisal of the Toronto Railway rolling stock in connection with the purchase of the property by the city. His work has also included car and equipment tests. The system in New Jersey with which Mr. Locke will become connected includes city suburban and interurban lines, but Mr. Locke's experience has covered engineering work on similar properties for which Mr. Richey has acted as consultant in the past.

O. D. Street McGraw-Hill Vice-President

Former Western Electric Official Is in Executive Charge of Transportation and Electrical Units of Publishing House

O. D. Street, well known for the past ten years as general manager of distribution of the Western Electric Company, has been elected vice-president of the McGraw-Hill Company, in executive charge of the ELECTRIC RAILWAY JOURNAL, *Bus Transportation, Electrical World, Electrical Merchandising, Journal of Electricity and Western Industry* and *Industrial Engineer*. Mr. Street brings to these publications a broad background of business training and a very extensive contact in the electrical industry.

O. D. Street

Mr. Street entered the organization of the Western Electric Company in 1901 on his graduation from Williams and has a broad practical training. He was in charge of telephone sales on the Pacific Coast, assistant to the president, Atlanta branch manager, general telephone sales manager and latterly general manager of distribution. During the war he rendered invaluable service in reorganizing the warehousing division of the Quartermaster's Corps and establishing an orderly system of forwarding to Pershing's army where chaos had existed before.

Under his administration the Western Electric system was expanded by the creation of twenty-two branch houses until Mr. Street was in executive charge of fifty jobbing houses distributing electrical supplies. This responsibility has entailed a personal contact with all sections of the country and all branches of the industry gained in the service of central stations, telephone systems, industrial plants and contractor-dealers, in co-operation with the manufacturers of practically all classes of electrical products. He has become a recognized authority on the broad problem of distribution, now become one of the most pressing issues before the industries of America.

Mr. Street was born in Massachusetts in 1877. He belongs to the Bankers', University and Williams Clubs in New York and the Siwanoy and Pittsfield Country Clubs.

Harry Engle Made Street Railway Commissioner at Youngstown

Harry Engle was appointed street railway commissioner of Youngstown, Ohio, for a term of four years by Mayor William G. Reese on Jan. 15. The appointment has since been confirmed by the City Council. Mr. Engle succeeds William A. Sause, who served as first commissioner for four years, taking office Jan. 16, 1919, when the service-at-cost ordinance became effective. Mr. Engle has been connected with public utility enterprises in various capacities since young manhood. At the time of his appointment as commissioner at Youngstown he was commercial agent for the Pennsylvania-Ohio Power & Light Company, Youngstown. Mr. Engle has appointed as his chief assistant A. W. Hartford, formerly manager Youngstown & Suburban Railway.

A. S. Davis Developing Plans for Power Expansion

A. S. Davis, who is assistant superintendent of power and lines of the United Electric Railways, Providence, R. I., was secured by his present employer on account of the plans for expansion of the power department which are now being carried out. Just previously he spent two years with Stone & Webster, Inc., principally on work in connection with the design of the new 130,000-kw. plant for the Hartford Electric Light Company. Before that he was for eight years supervisor of power plants for the Connecticut Company.

Mr. Davis began engineering work back in 1900, with Eaton, Chase & Company, installing steam and electrical machinery. After four years of this work, he entered Tufts College, graduating in 1908 with the B.S. degree. He then spent a couple of years with the J. G. White Engineering Corporation and one with the Electric Bond & Share Company, leaving to go with the Connecticut Company in 1911. He is a thorough and practical engineer, well versed in design and construction methods. He is right at home amid the bustle now in evidence at Providence, where new boilers to be equipped for burning pulverized fuel, a new turbine and much other new equipment are being installed.

Public Represented

Messrs. Blackmar, Niles and Metz All Elected Directors of Interborough Rapid Transit

The New York Transit Commission recently announced that it has designated as representatives of the public of the city in the reorganized board of directors of the Interborough Rapid Transit Company former Supreme Court Justice Abel E. Blackmar of Brooklyn, to serve for a full term of three years; William W. Niles of the Bronx, to serve for two years, and former Comptroller Herman A. Metz of Manhattan, to serve for one year.

The new board contains in all eighteen members, the successors of six of whom will be elected each year. It is in pursuance of this plan that the members designated by the Transit Commission are assigned one, two and three year terms, so that a successor to one of the three will be elected each year for a full term.

Judge Blackmar was counsel to the first Public Service Commission appointed by Governor Hughes in 1907, but was made a Justice of the Supreme Court in the fall of the same year and at the ensuing election was chosen for the full fourteen-year term. He retired from the bench only a few days ago. He is thoroughly conversant not only with the rapid transit law, but with the organization of the operating companies and the statutory functions of the Transit Commission with relation to them.

Mr. Niles, who is a lawyer, is a member of the Bronx Parkway Commission, and in 1909 served as a member of the commission appointed by Governor Hughes to revise the city charter. He has been identified for many years with the public affairs of the Bronx.

Mr. Metz was City Comptroller during much of the early period of subway building. Although now a resident of Manhattan he has continued to serve as chairman of the transit committee of the Brooklyn Chamber of Commerce and is thoroughly conversant with the city's transit affairs. An abstract of the address on transit in New York which he made on April 12, 1921, before the New York Electrical League was published in the ELECTRIC RAILWAY JOURNAL for April 30, 1921, page 811.

Representation of the public in the Interborough board is one of the many concessions required by the Transit Commission as a consideration for its approval of the Interborough plan of readjustment developed during the summer and fall. This plan, which was submitted to the security holders of the Interborough and Manhattan companies under date of May 1 becomes fully effective with the present reorganization of the board. Under the provisions of the voting trust agreement, executed in pursuance of the plan the number of directors was increased from fifteen to eighteen in order to permit the inclusion of the representatives of the public and an amendment to the by-laws was also adopted providing that the three additional directors need not be stockholders.

Under the voting trust agreement the Transit Commission was authorized to determine whether the public representatives should be chosen by the commission itself, by the city government or by the two acting in conjunction. In making its announcement, the commission, however, stated that as the city government, through the Corporation Counsel, has been attacking the reorganization plan itself and has apparently no sympathy with its purposes, the selection of the first representatives by the commission alone seemed to it the appropriate method. Legislation will be asked requiring that the members representing the public to be chosen next year and subsequently shall be appointed by the Board of Estimate.

W. J. Bertke Vice-president and Manager at Sioux City

W. J. Bertke, until recently manager of the Sioux City Gas & Electric Company, was elected vice-president and general manager of that company and the Sioux City Service Company following its acquirement on Nov. 2 by interests identified with the United Gas Improvement Company, Philadelphia, Pa. Mr. Bertke has been connected with various properties controlled by the United Gas Improvement Company since his graduation from the University of Wisconsin in 1903. At that time he enrolled in the cadet course being conducted by this company on its property in Sioux City. After two years in this course he was transferred to the Wyandotte County Gas Company in Kansas as assistant superintendent and two years later he returned to Sioux City as superintendent of production. A year later he was transferred to the distribution end of the business and two years later he took charge of both production and distribution.

Mr. Bertke became assistant general manager of the Sioux City Gas & Electric Company in 1917, the position he held until his recent advancement. Mr. Bertke's recent promotion presents to him for the first time problems of electric railway management, but in handling these he will be able to call on H. L. Kirk, formerly manager of the company, who was made president, also as a result of the combination of the two companies under one management.

Mr. Anger Heads Car Meter Department

Edward W. Anger has been appointed superintendent of the newly-established car meter division of the Chicago Surface Lines in charge of the records of operation of Economy car meters, to be installed on all of the company's cars, also the preparation of studies and reports thereon. This new division will consist of about fourteen persons. Mr. Anger has been with the company about twenty-five years mostly in the engineering department.

Messrs. Insull, Budd and Jones Interested in Utility Courses

Martin J. Insull, president of the Middle West Utilities Company, Chicago, Ill., recently addressed freshmen and sophomores of the College of Commerce of the university on "Training for the Utilities Business" and "Public Utilities Offer a Business Career." Mr. Insull accompanied a number of public utility men to the University of Illinois at Urbana to confer with faculty members and students of the College of Commerce in regard to courses offered preparatory to entering public utility service as a lifework. Proposals were discussed for such courses and the improvement of the public utilities curricula in the university. Besides Mr. Insull, Britton I. Budd, president of the Chicago Elevated Railways and the Chicago, North Shore & Milwaukee Railway, and George R. Jones, secretary-treasurer of the Northern Illinois Utilities Company, made the trip to Urbana.

The University of Illinois has for many years been especially strong in its offerings of courses in electrical engineering, electric railway engineering and steam railway engineering. The College of Commerce is now cooperating with the College of Engineering of the university in selecting courses which will fit men to enter the accounting and business ends of public utility fields.

The visit of Messrs. Insull, Budd and Jones was made in appreciation of the work now being offered by the university, with an invitation being extended to these men of practical utility experience to suggest changes or improvements in the work now undertaken.

The three visitors are said to have pledged their support and aid in making the courses more valuable to prospective public utility men of the next business generation.

Wray Thorn Joins Garford Truck Organization

Wray T. Thorn, assistant engineer of cars and equipment Board of Supervising Engineers, Chicago Traction, has become connected with the Garford Motor Truck Company, Lima, Ohio. Since his graduation from Purdue in 1903 a great deal of Mr. Thorn's work has had to do with the development of the design of electric railway cars and it is the knowledge thus gained and his acquaintance with transportation problems that he will be able to bring to bear upon the work of the Garford Company. Mr. Thorn served the Chicago board for more than ten years and during this period acted as a general consultant in the design of new passenger equipment, his most important work along these lines being for the Kansas City Railways. He was a member for two years of the committee on equipment of the American Electric Railway Engineering Association. Mr. Thorn was the author of a series of articles on the development of Chicago's street cars published in the issues of this paper for Sept. 23 and 30, 1922.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Board Withholds Censure

Coal Commission Is Unwilling to Express Its Conclusions Until All Facts Are Weighed

In its effort to be absolutely fair and to avoid placing responsibility before the blame is proved, the President's Coal Commission has brought out a report which is certain to be a disappointment to the consumers of coal and to many members of Congress. In the coal trade itself there is a very evident sense of relief. In the average investigation of this kind it is customary to have some harsh things to say to operators, wholesalers and retailers, even before it has been established that they are guilty.

The Jan. 15 report has all the indications of a desire to avoid expressing conclusions until all the facts can be weighed. As a consequence, it may be predicted that the smaller consumers and a certain element in Congress will feel that the report is colorless and that the commission is not reaching the seat of the trouble. It does not express an opinion as to whether or not current prices are just. It does not say whether or not the miners are receiving a higher rate of wages than the consumers should be called upon to pay. No one is accused of profiteering. The report indicates in a general way something as to the spread between the cost at the mine and the delivery cost of coal, but it gives no clue as to who is responsible. Labor, transportation, overdevelopment, storage and other matters are discussed, but little is said about the business factors in coal. For that reason it is certain that some of the gentlemen on Capitol Hill will conclude that the commission has written "Hamlet" with *Hamlet* left out.

Commission Purposely Deliberate

The more constructive thinkers both within and without the industry seem to be agreed that the commission did well in making haste slowly. Even those who are expressing much disappointment with the report are inclined to suspend final judgment as to the possibility of the commission bringing out something concrete at a later date.

A careful analysis of the report shows that there is little material in it which could not have been written on the first day that the commission sat. Nevertheless the presentation of this material is regarded as very valuable because the wide publicity will contribute greatly to the popular understanding of the entire subject. The report must be regarded more as a statement of the problems of the commission rather than a contribution to their solution. Not one shred of new statistical information is contained in the document. From a constructive point of view, this failure is regarded as the most serious because the report as it stands holds out no assistance to the New York conference. An unusual opportunity was offered to get material of a statistical character before that body, but this seems to have been made impossible by the mixup over the cost forms.

A significant feature of the report is the indication that the commission is not inclined to allow the coal industry to blame all of its ills on the transportation systems.

Commonwealth Edison Buys Parsons Turbine

A 40,000-kw. Parsons turbo-generator has been purchased by the Commonwealth Edison Company for use in the new Crawford Avenue station in Chicago. The set ordered from C. A. Parsons & Company, Newcastle-on-Tyne, will operate at a throttle pressure of 550 lb. with a total steam temperature of 725 deg. F., and after passing through the high pressure end of the turbine the steam will be reheated to the initial temperature. The turbine will be used in the new plant along with other turbines which will be mainly of American manufacture. The station is designed to have an ultimate capacity of 500,000 kw. This is the second turbo-generator of the Parsons manufacture that the Commonwealth Edison Company has purchased, the first being a 25,000-kw. set secured in 1912 and installed in the Fisk Street station, from which satisfactory operation has been secured. Sargent & Lundy of Chicago are engineers in charge of the design with Merz & McLellan, London, acting as advisory engineers.

President Herr Sees Bright Prospects Ahead

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, says that activity in the electrical industry in 1922 was not of such large proportions as seriously to embarrass the companies supplying electrical energy, but that it was great enough to call for extensions to many plants and to make evident to many more that their reserve capacity is gone. The extensions already made to existing power plants have been so limited to immediate needs that in several instances, even before the new apparatus has been completely installed, additional orders for greater capacity had to be placed. This, together with the increasing interest in railway electrification, gives promise of an active demand for electrical products during 1923.

As Mr. Herr sees it the needs of the world are so great that in spite of the halt in liquidation of war-time wages and prices it is probable a large volume of business will be done during the coming year. This should be especially true of the electrical manufacturing business, the uses for whose product are developing rapidly and should continue to do so for some time to come.

The development of higher voltages in electric power transmission and the collateral development of means of control and interconnection of such transmission lines into so-called "superpower zones" give promise of great economic results in this extremely important field.

Mexican Electrification in Prospect

Alfred Crewdson of Manchester, England, and British associates who own the Coahuila & Zacatecas Railroad are making preparations to electrify that line which runs between Saltillo, Mexico, and the mining town of Concepcion del Oro, 78 miles, with a branch line from San Pedro to Avalos, 17 miles. The railroad was built some years ago, primarily to serve the Mazapil Copper Company, Ltd., which is owned by the same interests. This company owns copper mines at Concepcion del Oro and Mazapil, and operates a smelter at the former place and another one at Saltillo. The railroad is of 3-ft. gage. Stephan Phindler, electrical engineer for the Mazapil Copper Company, Ltd., is now making the surveys and estimates for the proposed electrical installation.

The project involves the building of a dam and water storage reservoir and the erection of a hydro-electric plant. The advisability of changing the gage of the line to standard width and extending it through the State of Zacatecas is being considered. The road now connects with the National Railways of Mexico at Saltillo, but there is no interchange of cars because of the difference in gages of the two lines. R. H. Jeffrey is vice-president and general manager of the railroad at Saltillo.

Metal, Coal and Material Prices

Metals—New York	Jan. 16, 1923
Copper, electrolytic, cents per lb.	14.625
Copper wire base, cents per lb.	16.75
Lead, cents per lb.	7.60
Zinc, cents per lb.	7.07
Tin, Straits, cents per lb.	38.75
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$8.75
Somerset mine run, Boston, net tons	5.125
Pittsburgh mine run, Pittsburgh, net tons	3.375
Franklin, Ill., screenings, Chicago, net tons	2.70
Central, Ill., screenings, Chicago, net tons	2.125
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	6.35
Weatherproof wire base, N.Y., cents per lb.	16.50
Cement, Chicago net prices, without bags	$2.05
Linseed oil (5-bbl. lots), N.Y., cents per gal.	93.00
White lead, (100-lb. keg), N.Y., cents per lb.	12.625
Turpentine, (bbl. lots), N.Y., per gal.	$1.55

Rolling Stock

Beaver Valley Traction Company, New Brighton, Pa., expects to buy some new passenger cars in the near future.

Lima (Ohio) City Railway expects to have five new one-man cars in service by Feb. 1. Fifteen more cars will be placed in service during the rest of the year.

Indiana Service Corporation, Fort Wayne, Ind., has placed in commission six of the fifteen new cars ordered several months ago for use on city lines in Fort Wayne, Ind. The remaining nine cars will be added as they are received from the shops.

Interstate Public Service Company, Indianapolis, Ind., expects to purchase three combination dining and chair cars within the next few weeks. Each car will be equipped with two motors for multiple-unit operation in trains.

Louisville (Ky.) Railway lost fourteen double-truck cars, fifteen single-truck cars and six trailers in a fire late on Jan. 15, which partly destroyed its Fourth Street carhouse. President Barnes estimates the loss at $350,000. Other details about the fire are contained in an item elsewhere in this issue.

Signal Equipment

Morris County Traction Company, Morristown, N. J., is arranging to install an automatic block signal system on its lines which run from Lake Hopatcong to Maplewood and Elizabeth.

The Philadelphia & West Chester Traction Company, Upper Darby, Pa., has recently completed plans for increasing the terminal facilities at their Sixty-ninth Street Terminal, Philadelphia, Pa., where passengers are transferred to the lines of the Philadelphia Rapid Transit Company. Three new station tracks are being added, making a total of eight. The rearrangement of the yard involves the addition of thirty-five new switches, making a total of fifty-six, and ten new signals, making a total of twenty-seven. The interlocking plant will be electro-pneumatic employing color light signals. Alternating current is being used throughout for the forty-six track circuits as well as for the control and indication of the switches and signals. The machine will have fifty-five working levers in a seventy-nine lever frame. All interlocking apparatus is being furnished and installed by the Union Switch & Signal Company.

Track and Roadway

North Carolina Public Service Company, Greensboro, N. C., is placing steel cross-ties mounted in a base of concrete to support the rails on West Lee Street. The company is repaving that portion of West Lee Street which lies between the rails of the car track and a distance of 18 in. outside each rail.

South Covington & Cincinnati (Ohio) Street Railway plans to spend $300,000 this year in laying new tracks on various thoroughfares in Covington, Latonia and Ludlow, Ky. This announcement was made by W. H. Harton, general manager of the traction company, at a meeting of the Covington Board of City Commissioners. Mr. Harton also said that the traction company would start to lay new rails on Main Street in Covington and on DeCoursey Avenue in Latonia as soon as the weather permitted.

Power Houses, Shops and Buildings

Potomac Public Service Company, Frederick, Md., is making rapid progress in the erection of the $2,000,000 electric power plant which is being built along the Potomac River at Williamsport, Md.

Boston (Mass.) Elevated Railway is roofing in the large new storehouse near the Charlestown line at Sullivan Square, Somerville, Mass. It is hoped the structure will be ready for occupancy in the early spring. The building is three stories high, 120 x 40 ft., of reinforced concrete and fireproof construction.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., has been granted permission by the City Council at Brazil, Ind., to run a high-tension line along two streets in that city, to connect the substation there with the Indianapolis high-tension line. At present Brazil obtains electric current from the station at Terre Haute and in case of a break in the line from that station the city is without lights or power.

Trade Notes

Consolidated Car-Heating Company, Albany, N. Y., has transferred L. S. Belding from the engineering department in Albany, to the sales department in Chicago, where he is under the direction of J. A. Robinson, general sales agent.

Stewart-Thill Company is the new name of the Walter L. Flower Company of St. Louis, district representatives of the Conveyors Corporation of America, Chicago. The personnel of the organization remains the same and offices will be continued at 312 Eighth Street, St. Louis, Mo.

National Railway Appliance Company, New York, N. Y., announces its appointment as agent for the Pittsburgh (Pa.) Forge & Iron Company for the States of New York and New Jersey and will be glad to give prompt and careful attention to all inquiries for the products of the latter company, which embrace bar iron, splice bars, track bolts, machine bolts, iron and steel car and locomotive axles, foundation bolts, arch bars, screw spikes, bridge bolts, plain and upset ends, links and pins, crank pins and tie plates.

Hardwood Manufacturers' Institute, Memphis, Tenn., has announced the appointment of Roy H. Jones as assistant to J. M. Pritchard, secretary-manager. During the war Mr. Jones was in Washington as manager of the Hardwood Emergency Bureau representing the lumber interests of Wisconsin and Michigan.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has announced the appointment of C. G. Taylor as director of purchases. He will have general supervision of the purchasing activities of all plants. C. G. Bunnell has been appointed purchasing agent of the East Pittsburgh Works to succeed Mr. Taylor.

E. C. Brandt, works manager of the Westinghouse-Krantz Works, has been appointed works manager of the new plant now being erected by the Westinghouse Electric & Manufacturing Company in Homewood, Pittsburgh. Mr. Brandt in 1905 entered upon the mechanical training course of the Westinghouse Electric Company and in 1907 began work for the company as a general mechanic and small tool designer. Since then he has held a number of important positions. He is a member of the Western Pennsylvania engineering Society and has written articles for engineering magazines and delivered a number of papers before engineering societies.

New Advertising Literature

General Electric Company, Schenectady, N. Y., has issued No. 1 of a series of messages designed to supply information on the products which it manufactures and to the scientific research back of their development. The first tells about Edison and National Mazda lamps.

Ohio Brass Company, Mansfield, Ohio has published a de luxe pamphlet (catalog No. 210) entitled "Imperial Headlights for Electric Railways. The booklet containing 252 pages with illustrations describes in detail the Crouse-Hinds luminous arc, carbon arc and incandescent for use in electric railway service.

The Dayton Air Brush Company, Dayton, Ohio, has issued a twenty-page illustrated catalog describing the Dayton air brush—what it is, what it does and why the manufacturer should have this equipment. The pamphlet contains a reprint of several letters written to the company which tell of the satisfaction these brushes give. The Dayton brush, according to the pamphlet, is for universal use and can be used for spraying and flowing all kinds of paints, enamels, varnish, shellac, kalsomine, disinfectants, gasoline, oils and all liquids for all purposes.